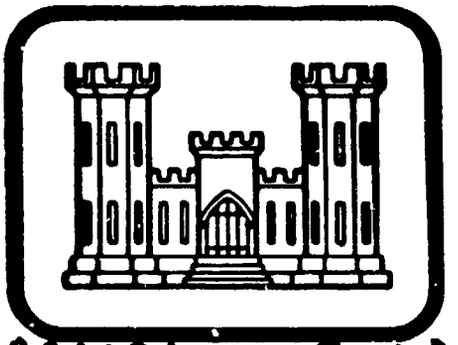
LEVEL II

AD A108968

SUSQUEHANNA RIVER BASIN
SPRING GROVE DAM
P. H. GLATFELTER COMPANY

NDI NO. PA-01028
DER NO. 67-004

YORK COUNTY, PENNSYLVANIA
PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM



DACW31-81-C-0013

PREPARED FOR

DEPARTMENT OF THE ARMY
Baltimore District, Corps of Engineers
Baltimore, Maryland 21203

Hendrik Jongsma
BY
Berger Associates
Harrisburg, Pennsylvania 17105

JULY 1981

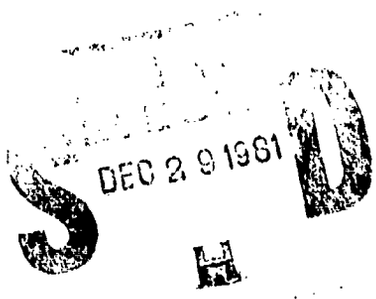
PREFACE

This report has been prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The spillway design flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.



PHASE I REPORT
NATIONAL DAM INSPECTION PROGRAM

BRIEF ASSESSMENT OF GENERAL CONDITIONS
AND RECOMMENDATIONS

Name of Dam: SPRING GROVE DAM

State & State No.: PENNSYLVANIA, 67-004

County: YORK

Stream: CODORUS CREEK

Date of Inspection: APRIL 27, 1981

Based on the visual inspection, past performance and the available engineering data, the dam and its appurtenant structures appear to be in fair condition.

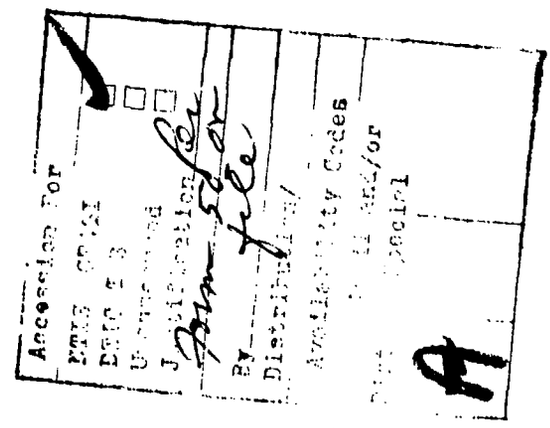
In accordance with the Corps of Engineers' evaluation guidelines, the size classification of this dam is small and the hazard classification is significant. These classifications indicate that the Spillway Design Flood (SDF) should be in the range of the 100 year flood to one-half the Probable Maximum Flood (PMF). The recommended SDF for this structure is the 100 year flood. The spillway capacity is sufficient for passing the SDF peak inflow without overtopping the dam. The spillway, therefore, is considered to be adequate.

The following recommendations are presented for immediate action by the owner.

1. That the narrow crest between the parapet wall and the building be widened and the slope flattened.

2. That heavy rock for erosion protection be placed downstream of the spillway weir slab to prevent undermining of the slab.

3. That the flood control plan be expanded to include a downstream warning system.



SPRING GROVE DAM NDI NO. PA-01028 DER NO. 67-004

P.H. GLATFELTER CO. YORK COUNTY

4. That an operation and maintenance manual be prepared for guidance in the operation of the dam during normal and emergency conditions, and that a schedule be maintained for the annual inspection of the dam and its appurtenant structures.

SUBMITTED BY:

BERGER ASSOCIATES, INC.
HARRISBURG, PENNSYLVANIA

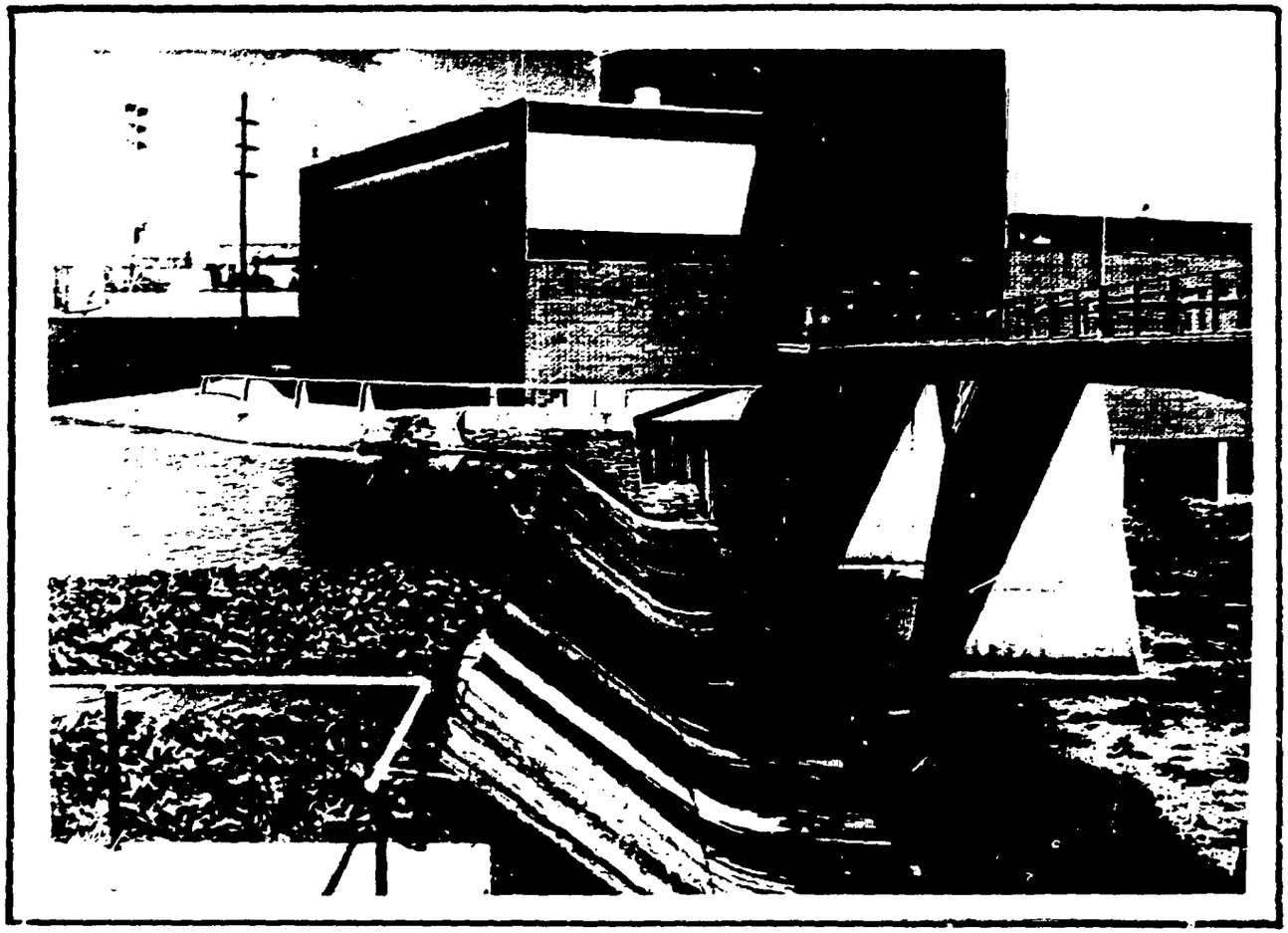
DATE: July 31, 1981

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
HENDRIK JONGSMA
ENGINEER

APPROVED BY:

James W. Peck
Colonel, Corps of Engineers
Commander and District Engineer

DATE: 7 Aug 81



OVERVIEW

SPRING GROVE DAM

Photograph No. 1

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PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

SPRING GROVE DAM

NDI NO. PA-01028
DER NO. 67-004

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL

A. Authority

The Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of inspections of dams throughout the United States.

B. Purpose

The purpose of this inspection is to determine if the dam constitutes a hazard to human life and property.

1.2 DESCRIPTION OF PROJECT

A. Description of Dam and Appurtenances

Note: All elevations have been referenced to a U.S.G.S. benchmark located in the left abutment of the spillway. The elevation of this benchmark, obtained from U.S.G.S., is 457.84. The inspection survey determined a normal pool elevation of 451.3, compared with a pool elevation 450.75 shown on Plate V, Appendix E, and elevation 457.0 shown on the U.S.G.S. quadrangle sheet.

Spring Grove Dam is located within the boundaries of the P.H. Glatfelter Company property. Extensive changes have been made to this facility in the recent years in order to provide flood protection for the industrial complex. Considerable damage was caused by the Agnes storm in June 1972. The left end of the dam abuts with one of the buildings within the complex. A railroad at this jointure is provided with a sandbag closure. An earth embankment with a 2.4 foot high concrete parapet wall extends 240 feet to the right. At the end of the parapet wall, the crest of the earth embankment is at the same elevation of the wall. The present alignment bends at the end of the parapet wall, curves around a building, then ties into the left spillway abutment wall. The spillway is 255 feet long between the left and right abutment. Both abutments are concrete. The right earth embankment consists of a

wide fill. A treatment plant is located in this area. The overall length of the facilities is about 800 feet. The maximum height of embankment is about 18 feet above the downstream toe.

B. Location: Borough of Spring Grove and North Codorus Township, York County
U.S.G.S. Quadrangle - Seven Valleys, PA
Latitude 39°-52.1', Longitude 76°-52.0'
Appendix E, Plates I & II

C. Size Classification: Small: Height - 18 feet
Storage - 589 acre-feet

D. Hazard Classification: Significant (Refer to Section 3.1.E.)

E. Ownership: P.H. Glatfelter Co.
Mr. C. Neal Carter, Environmental Director
228 South Main Street
Spring Grove, PA 17362

F. Purpose: Industrial water supply

G. Design and Construction History

The dam was constructed in 1863 to provide a water supply for the paper mill and the borough. The first inspection by representatives of the predecessor of the Pennsylvania Department of Environmental Resources (PennDER) occurred in 1914. The report following this inspection indicates that the 255 foot long spillway consisted of a rock ballasted timber A-frame structure with timber sheeting at the upstream and downstream side. A clay fill on the upstream side provided a watertight structure. The spillway was about 4.4 feet below the crest of the embankment. The spillway capacity was then considered to be inadequate. The spillway was later concreted and the crest of the embankment was raised. The embankment was overtopped in 1972 and the owner installed the concrete parapet wall and raised the earth embankment crest elevation to prevent future flooding of the industrial plant.

H. Normal Operating Procedures

All inflow is discharged over the uncontrolled spillway. Operating facilities are limited to pipe intakes for industrial purposes.

1.3 PERTINENT DATA

A. Drainage Area (square miles)

From files:	67
Computed for this report:	73.4
Use:	73.4

B. Discharge at Dam Site (cubic feet per second)
See Appendix D for hydraulic calculations.

Maximum known flood (June, 1972)	19400
Spillway capacity at pool Elev. 457.5 (low point of dam)	11763
Spillway capacity at pool Elev. 460.1 (top of flood protection)	17494

C. Elevation (feet above mean sea level)

Top of dam (low point)	457.5
Top of dam (flood protection level)	460.1
Spillway crest	451.3
Streambed at downstream toe of dam (estimate)	439.3

D. Reservoir (miles)

Length of normal pool (Elev. 451.3)	0.5
Length of maximum pool (Elev. 457.5)	1.3

E. Storage (acre-feet)

Spillway crest (Elev. 451.3)	33.8
Top of dam (Elev. 457.5)	589

F. Reservoir Surface (acres)

Spillway crest (Elev. 451.3)	23
Top of dam (Elev. 457.5)	181

G. Dam

Refer to Plates II, III and IV in Appendix A for schematic plan and section.

Type:	Earthfill.
Length:	800 feet.
Height:	18 feet.

Top Width: Design - varies; Survey - varies, minimum 8 feet.

Side Slopes:	Design	Surveyed
Upstream	Unknown	1.4H to 1V
Downstream	Unknown	1.7H to 1V

Zoning: None.

Cutoff: None.

Grouting: None.

H. Outlet Facilities

None

I. Spillway

Type: Concrete, broad crested weir with both faces inclined.

Length of Weir: 255 feet (as surveyed).

Crest Elevation: 451.3

J. Regulating Outlets

None.

SECTION 2 - ENGINEERING DATA

2.1 DESIGN

Engineering data for the original construction of Spring Grove Dam does not exist. The available information is limited to reports prepared by PennDER and some drawings indicating proposed changes to the spillway and spillway abutment walls.

2.2 CONSTRUCTION

A report, prepared by PennDER in February 1914, indicates that the original dam was constructed in 1863. The dam had a 255 foot long, rock ballasted timber spillway which was backed on the upstream side with a clay fill. The heavy masonry abutments were founded on firm material. The crest of the dam was only three feet above the crest elevation of the spillway and overtopping occurred in 1889. When the water receeded, the saturated embankment failed and breached. The embankment and the south spillway abutment wall were reconstructed and the crest of the dam was raised to 4.4 feet above the spillway elevation. It was reported that the embankment was founded on firm clay and was constructed of a good clay material. A concrete headrace was constructed in 1889 (Plate III, Appendix E).

PennDER considered the spillway capacity inadequate and requested that the abutments and embankment be raised about three feet.

In June 1915, concrete was placed on the upstream side of the spillway weir, replacing the planking. It is assumed that this concrete formed a new coping at the top of the weir. In 1924, a permit was issued by PennDER to replace the downstream planking with concrete (Plate IV, Appendix E).

In 1930, the crest of the right embankment was raised to the spillway abutment elevation under the permit issued in 1914. Heavy sedimentation in the reservoir occurred, making the average reservoir depth only 2 feet. During the 1930's the reservoir was excavated to a minimum depth of six feet. Additional construction occurred in the late seventies after the Agnes storm (June 1972). The flood protection was improved by the construction of a concrete parapet wall over a length of 240 feet and raising the embankment from the south end of this wall to the building. Sandbags are stored at the site for closing the openings in the wall.

2.3 OPERATION

The facilities are located within the industrial complex of the P.H. Glatfelter Co. An informal inspection of the facilities is made on a daily basis. Operating facilities are limited to valves for industrial water intake. Records of pool levels are not maintained. All inflow is discharged over the uncontrolled spillway.

2.4 EVALUATION

A. Availability

The available engineering data was obtained from the PennDER files in Harrisburg, Pennsylvania. The flood control plan (Plate V) was obtained from the owner.

B. Adequacy

Because of the limited available engineering and construction data, the assessment of the dam is based on the conditions as observed during the visual inspection.

C. Operating Records

Operating records have not been maintained.

D. Post Construction Changes

Reference is made to Section 2.2 for a description of post construction changes.

SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS

A. General

The general appearance of Spring Grove Dam is fair. Settling basins are located immediately downstream of the left embankment. There were no signs of sloughage or seepage. The embankment alignment has been changed over the years and is not straight. The spillway shows signs of deterioration.

The visual inspection check list and sketches of the general plan and profile of the dam, as surveyed during the inspection, are presented in Appendix A of this report. Photographs of the facilities taken during the inspection are reproduced in Appendix C.

Mr. Roth represented the owner and accompanied the inspectors on the day of inspection.

B. Embankment

The left embankment abuts one of the industrial buildings and a railroad. Sandbags are stored adjacent to the railroad to close off this opening during flood flows. A concrete parapet wall begins at a distance of fourteen feet from the building. This wall increases the flood protection by approximately 2.4 feet above the previous earthfill elevation (Photographs No. 3, 4 and 7). The embankment has an actual width of about 14 feet and an upstream slope of 1.4H to 1V. Several sheds or buildings are located on the downstream slope of the embankment. One opening in the wall, located near its center, is used for access to industrial intake valves. This opening can be closed off with stoplogs (Photographs No. 4 and 6).

At the end of the parapet wall the embankment alignment turns upstream towards the reservoir (Photograph No. 2). The crest of the embankment here is level with the elevation of the parapet wall. The embankment surface consists of stone, is pervious and is used regularly for access to different parts of the plant. A pipe is located on top of the fill. The crest in this area is only eight feet wide and the slopes are steep (Plate A-III, Appendix A). The embankment is warped around a new industrial building and ties into the left abutment of the spillway. The embankment on the right side of the spillway is short. The area beyond the embankment is the location of a treatment plant (Photographs No. 10 and 11).

Most of the embankment has a stone surface. Some riprap and weeds are located on the upstream slope. There were no indications of slides, sloughs or seepage.

C. Appurtenant Structures

The spillway is located near the present right abutment of the embankment. The spillway abutment walls are massive concrete structures (Photographs No. 11 and 13). The left abutment has been tied into the new building with steel sheetpiling. The weir has a concrete surface and has deteriorated slightly (Photograph No. 14). At the downstream end of the concrete slab, there is a 2.0 to 2.5 foot deep pool. This pool is about 15 feet wide and has been caused by erosion during high discharges.

Valves for control of industrial water supply are located at the upstream slope of the left embankment (Photograph No. 5).

D. Reservoir Area

The reservoir is bordered by nearly level land which is used for industrial purposes. The area is about five feet above normal pool. The slopes appear to be stable.

E. Downstream Channel

The immediate downstream channel of Codorus Creek below the dam is formed on the left side by an industrial building. This building overhangs the channel and is supported on piers in this area (Photograph No. 16). The right side is formed by an earth dike. A footbridge, which is also used to carry pipes, is located about 30 feet downstream from the spillway. The bridge is supported on three high piers. A two span bridge which carries Route 516 over Codorus Creek is located about 800 feet downstream of the dam. There are no other structures located in the floodplain of Codorus Creek over the next four miles.

A control plan has been initiated by the owner for surveillance of the dam when the depth of water exceeds twelve inches over the weir. Industrial buildings are located below the left embankment at or below normal pool elevation. A potential hazard to loss of a few lives and appreciable economic loss exists downstream if the dam fails. The hazard category is therefore considered to be "Significant."

3.2 EVALUATION

The overall visual evaluation of the facilities indicates that the Spring Grove Dam is in fair condition. The facilities has a "cluttered" appearance due to the presence of industrial facilities on and adjacent to the embankment. Although no seepage or sloughs were detected, the crest is narrow at several locations and should be brought to a uniform width and the embankment slope should be flattened. The concrete spillway shows signs of deterioration. Riprap should be placed at the toe of the spillway to prevent undermining of the slab.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 PROCEDURES

There are no operating facilities at Spring Grove Dam other than the intake valves for industrial use. An extensive flood control plan dated August, 14, 1979, exists for protection of the industrial buildings. This plan is activated when the pool level reaches one foot above normal pool level and stipulates what actions shall be taken to protect the site for floods up to 100 inches above the normal pool. It dictates at what stage sandbags shall be placed in the low areas and who is responsible and where the bags are located. An annual inspection program for the dam is also in existence.

4.2 MAINTENANCE OF EMBANKMENT

The embankment is covered with weeds on the upstream slope and some grass on the downstream slope. Most of the embankment, however, has a gravel surface.

4.3 MAINTENANCE OF OPERATING FACILITIES

Operating facilities are for industrial use only and were not inspected. There are no drawdown facilities.

4.4 WARNING SYSTEM

There is a formally organized surveillance system (flood control plan) which is activated when pool level reaches 12 inches above the spillway weir. A downstream warning system is not included in the write-up of the flood control plan.

4.5 EVALUATION

The operational procedures for Spring Grove Dam are limited to a flood control plan and an annual in-house inspection program. It is recommended to extend the flood control plan to include a formal downstream warning system for implementation during periods of heavy or prolonged rainfall.

SECTION 5 - HYDROLOGY/HYDRAULICS

5.1 EVALUATION OF FEATURES

A. Design Data

The hydrologic and hydraulic analyses available from PennDER for Spring Grove Dam were not very extensive. No stage-discharge curve, stage-storage curve, design flood hydrograph, nor flood routings were submitted by the designer to PennDER.

B. Experience Data

The maximum known flood at Spring Grove Dam occurred in June 1972, and caused the water level in the lake to reach an elevation of 98 inches above the spillway crest. This flood was recorded at the U.S.G.S. stream gage on Codorus Creek, a short distance downstream of the dam, as 19400 cfs. The embankment was overtopped by that event; however, the project passed that flood without damage to the dam.

C. Visual Observations

It was noted that there are no drawdown facilities for this dam. Water can be drawn from the lake for industrial water supply and processed waste water reenters the channel downstream.

An extensive flood protection plan exists for this dam. The plan calls for filling low areas in the dam and raising the top of dam to 8.8 feet above the spillway crest. Computations in Appendix D include the flood protection provisions.

D. Overtopping Potential

Spring Grove Dam has a total storage capacity of 589 acre-feet and an overall height of 18 feet, both referenced to the top of the dam, prior to flood protection measures. These dimensions indicate a size classification of "Small." The hazard classification is "Significant" (see Section 3.1.E.).

The recommended Spillway Design Flood (SDF) for a dam having the above classifications is in the range of the 100 year flood to one-half the Probable Maximum Flood (PMF). Because of the small size of this dam, the recommended SDF is the 100 year flood. For this dam, the SDF peak inflow is 16600 cfs (see Appendix D for gage analysis computations).

Comparison of the estimated SDF peak inflow of 16600 cfs with the estimated total spillway discharge capacity of 17494 cfs, based on the flood protection elevation 460.1, indicates that a potential for overtopping of the Spring Grove Dam does not exist.

E. Spillway Adequacy

The small size and significant hazard categories, in accordance with the Corps of Engineers' criteria and guidelines, indicates that the SDF for this dam should be in the range of the 100 year flood to one-half the PMF. The recommended SDF is the 100 year flood.

Since the spillway discharge capacity can pass the SDF without overtopping, the spillway is considered to be adequate.

The hydrologic analysis for this investigation was based upon existing conditions of the watershed. The effects of future development were not considered.

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

A. Visual Observations

1. Embankment

The visual inspection of Spring Grove Dam did not reveal any signs of seepage through the embankment. The slopes are apparently stable. The crest of the embankment over most of its length is only eight feet above the present downstream toe. The crest is narrow at several locations and the downstream slope is steep. The concrete parapet wall appears adequate for the 2.4 foot height.

2. Appurtenant Structures

The concrete face on the downstream side of the spillway weir shows signs of deterioration. Riprap should be placed downstream of the spillway weir to prevent possible undermining of the slab.

B. Design and Construction Data

Design and construction data for the embankment do not exist.

C. Operating Records

Operating records for this dam have not been maintained by the owner. Many changes have occurred since the dam breached in 1889. The overtopping in 1972 caused no major damage to the embankment.

D. Post Construction Changes

Reference is made to Section 2.2 for a discussion of the known post construction changes since its completion in 1863.

E. Seismic Stability

This dam is located in Seismic Zone 1, and it is considered that the static stability is sufficient to withstand minor earthquake-induced dynamic forces. No studies or calculations have been made to confirm this assumption.

SECTION 7 - ASSESSMENT AND RECOMMENDATIONS

7.1 DAM ASSESSMENT

A. Safety

The visual inspection indicates that Spring Grove Dam is in fair condition. Engineering design and construction data are very limited. The embankment appears to be stable. A small section of the embankment has a narrow crest and a steep downstream slope.

In accordance with the Corps of Engineers' evaluation guidelines, the size classification of this dam is small and the hazard classification is significant. These classifications indicate that the Spillway Design Flood (SDF) should be in the range of the 100 year flood to one-half the Probable Maximum Flood (PMF). The recommended SDF for this structure is the 100 year flood.

The hydrologic and hydraulic computations indicate that the discharge capacity of the spillway is sufficient for passing the SDF. The spillway is therefore considered to be adequate.

B. Adequacy of Information

The visual inspection is considered to be sufficiently adequate for making a reasonable assessment of this dam.

C. Urgency

The recommendations presented below should be implemented immediately.

D. Additional Studies

Additional studies are not required at this time if the recommendations are implemented immediately.

7.2 RECOMMENDATIONS

In order to assure the continued satisfactory operation of this dam, the following recommendations are presented for immediate implementation by the owner:

1. That the narrow crest between the parapet wall and the building be widened and the slope flattened.

2. That heavy rock for erosion protection be placed downstream of the spillway weir slab to prevent undermining of the slab.

3. That the flood control plan be expanded to include a downstream warning system.

4. That an operation and maintenance manual be prepared for guidance in the operation of the dam during normal and emergency conditions, and that a schedule be maintained for the annual inspection of the dam and its appurtenant structures.

APPENDIX A

CHECK LIST OF VISUAL INSPECTION REPORT

CHECK LIST

PHASE I - VISUAL INSPECTION REPORT

PA DER # 67-004 NDI NO. PA-01028

NAME OF DAM Spring Grove Dam HAZARD CATEGORY Significant

TYPE OF DAM earthfill with concrete parapet wall, buildings, etc.

LOCATION Borough of Spring Grove & North Codorus TOWNSHIP York COUNTY, PENNSYLVANIA

INSPECTION DATE 4/27/81 WEATHER sunny TEMPERATURE 60's

INSPECTORS: R. Houseal (Recorder) OWNER'S REPRESENTATIVE(s):

H. Jongsma Joe Roth

R. Shireman

A. Bartlett

NORMAL POOL ELEVATION: 451.3 (USGS) AT TIME OF INSPECTION:

BREAST ELEVATION: varies POOL ELEVATION: 451.3+

SPILLWAY ELEVATION: 451.3 TAILWATER ELEVATION:

MAXIMUM RECORDED POOL ELEVATION: 459.5

GENERAL COMMENTS:

NDI NO. PA-01028

VISUAL INSPECTION
EMBANKMENT

	OBSERVATIONS AND REMARKS
A. SURFACE CRACKS	None detected.
B. UNUSUAL MOVEMENT BEYOND TOE	None. Treatment plant immediately downstream.
C. SLOUGHING OR EROSION OF EMBANKMENT OR ABUTMENT SLOPES	None.
D. ALIGNMENT OF CREST: HORIZONTAL: VERTICAL:	See plan, Plate A-I and Plate V, Appendix E. Irregular alignment, interrupted with buildings.
E. RIPRAP FAILURES	Some riprap on upstream slope. No failures.
F. JUNCTION EMBANKMENT & ABUTMENT OR SPILLWAY	At left end buts into railroad. Opening can be sandbagged. Right abutment against building.
G. SEEPAGE	None detected.
H. DRAINS	None.
J. GAGES & RECORDER	None.
K. COVER (GROWTH)	Upstream slope weeds. Crest stone surface. Downstream slope mostly stone.

NDI NO. PA-01028

VISUAL INSPECTION
OUTLET WORKS

	OBSERVATIONS AND REMARKS
A. INTAKE STRUCTURE	None.
B. OUTLET STRUCTURE	None.
C. OUTLET CHANNEL	None.
D. GATES	None.
E. EMERGENCY GATE	None.
F. OPERATION & CONTROL	None.
G. BRIDGE (ACCESS)	None.

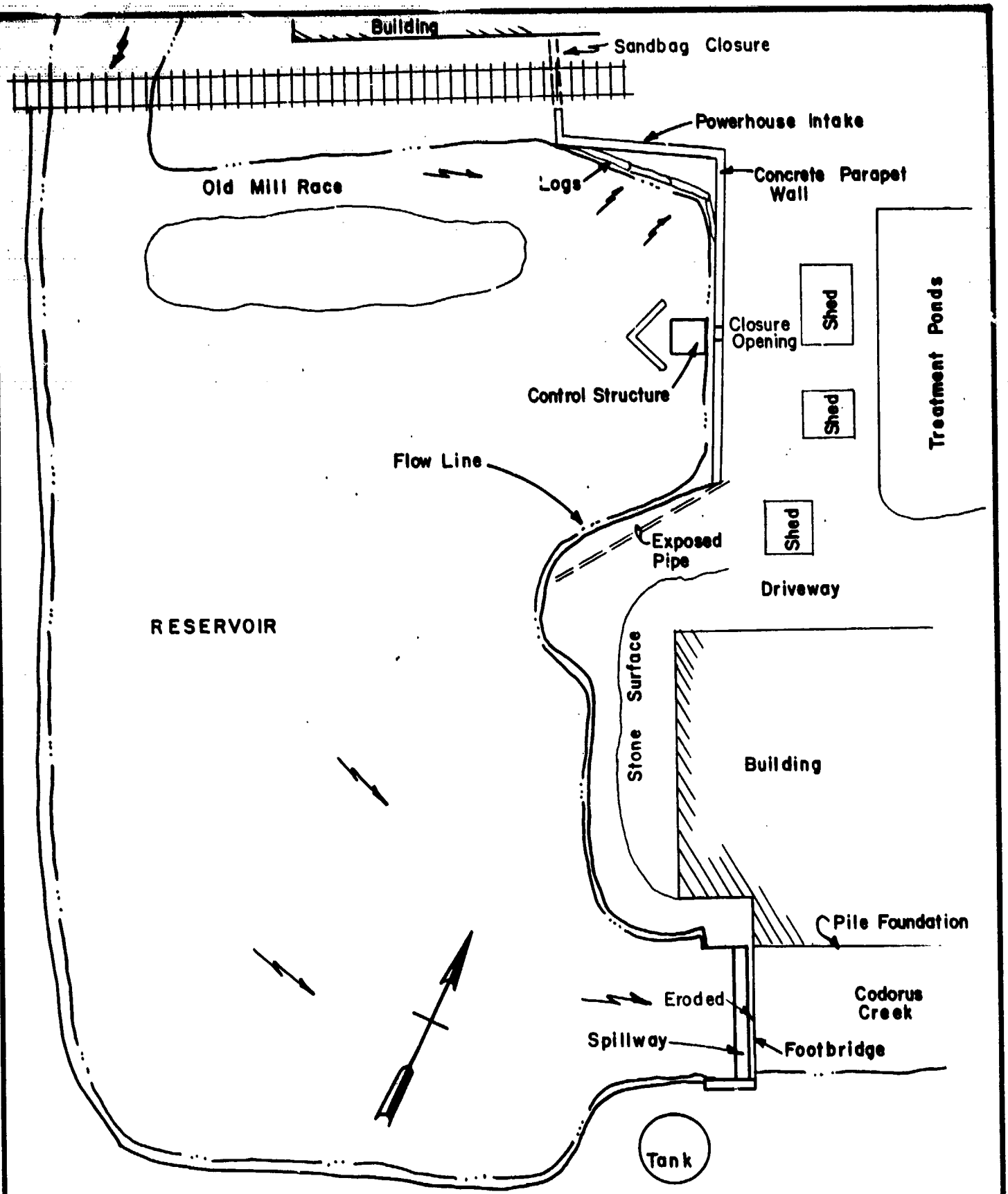
NDI NO. PA-01028

VISUAL INSPECTION
SPILLWAY

	OBSERVATIONS AND REMARKS
A. APPROACH CHANNEL	Direct from reservoir. Lily plants, indicating shallow reservoir.
B. WEIR: Crest Condition Cracks Deterioration Foundation Abutments	Narrow concrete crest. Considerable deterioration. Several cracks and small holes on downstream slope.
C. DISCHARGE CHANNEL: Lining Cracks Stilling Basin	Stone lined channed beyond the concreted weir. Erosion has caused a 2 to 2.5 foot deep pool at end of slab about 15 feet wide.
D. BRIDGE & PIERS	3 piers downstream of weir supporting a footbridge and pipe crossing.
E. GATES & OPERATION EQUIPMENT	None.
F. CONTROL & HISTORY	Maximum flow of 8'-2" over weir during Agnes (June, 1972).

VISUAL INSPECTION

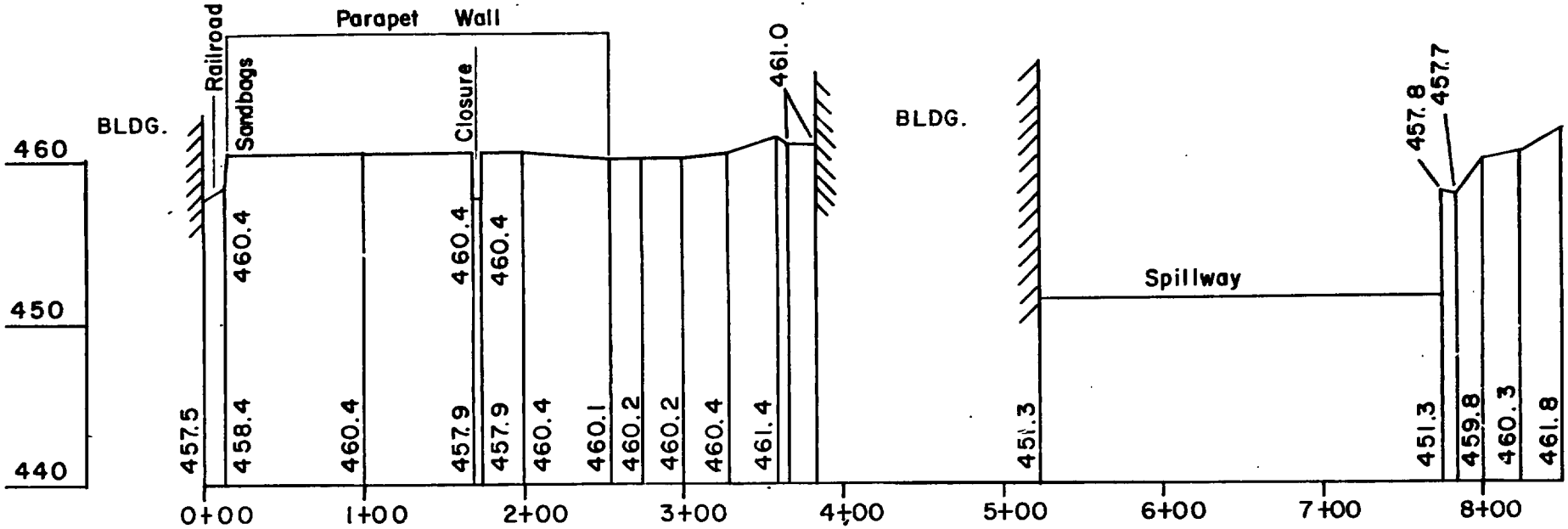
	OBSERVATIONS AND REMARKS
INSTRUMENTATION	
Monumentation	On left spillway abutment B.M. elev. 457.84.
Observation Wells	None.
Weirs	None.
Piezometers	None.
Staff Gauge	Near valves for industrial intake.
Other	None.
RESERVOIR	
Slopes	Stable. Most about 2.5 to 1V.
Sedimentation	Considerable.
Watershed Description	Mostly cultivated land.
DOWNSTREAM CHANNEL	
Condition	Natural stream. Building on left side, dike on right side.
Slopes	Building on piles. Moderate slopes.
Approximate Population	Varies according to working hours.
No. Homes	Industrial plant, parking, highway.



SPRING GROVE DAM
PA-01028
INSPECTION SURVEY

SURVEYED 4-27-81

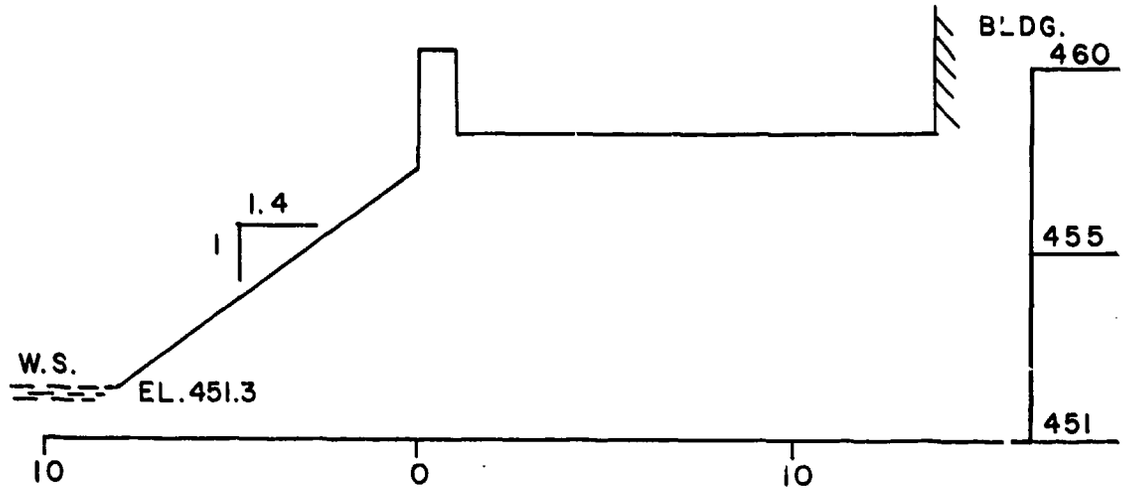
PLATE A-I



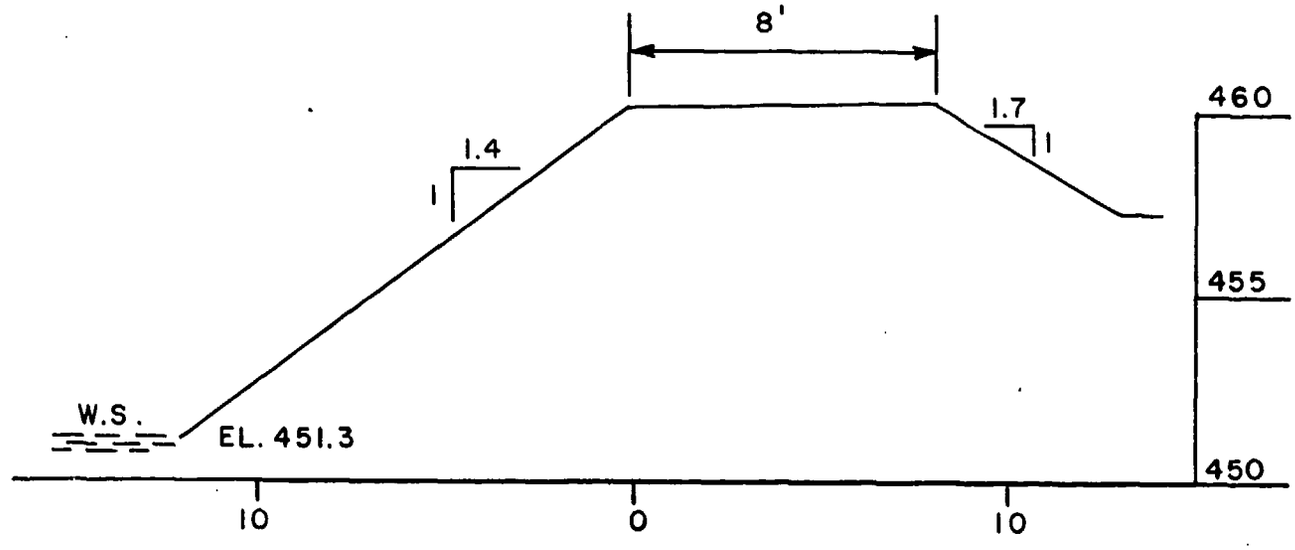
EMBANKMENT PROFILE

SPRING GROVE DAM
PA - 01028
INSPECTION SURVEY
PLATE A-II

SURVEYED 4-27-81



EMBANKMENT SECTION STA. 1+90



EMBANKMENT SECTION STA. 3+00

SPRING GROVE DAM

PA - 01028

INSPECTION SURVEY

SURVEYED 4-27-81

PLATE A-III

APPENDIX B

CHECK LIST OF ENGINEERING DATA

CHECK LIST
ENGINEERING DATA

PA DER # 67-004 NDI NO. PA-01028

NAME OF DAM Spring Grove Dam

ITEM	REMARKS
AS-BUILT DRAWINGS	Not available.
REGIONAL VICINITY MAP	U.S.G.S. Quadrangle - Seven Valleys, PA See Plate II, Appendix E
CONSTRUCTION HISTORY	Original construction in 1863. Breached in 1889. Crest of embankment raised in 1930 and in 1975. Spillway abutment walls raised in 1915. Spillway weir concreted in 1924.
GENERAL PLAN OF DAM	Refer to Plate III, Appendix E. Many changes made since 1914. Refer to Plate V for general location.
TYPICAL SECTIONS OF DAM	Not available.
OUTLETS: PLAN DETAILS CONSTRAINTS DISCHARGE RATINGS	None.

NDI NO. PA-01028

ENGINEERING DATA

ITEM	REMARKS
RAINFALL & RESERVOIR RECORDS	No records.
DESIGN REPORTS	None.
GEOLOGY REPORTS	None.
DESIGN COMPUTATIONS: HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	None.
MATERIALS INVESTIGATIONS: BORING RECORDS LABORATORY FIELD	No records.
POST CONSTRUCTION SURVEYS OF DAM	None.
BORROW SOURCES	Unknown. Good clay available in area.

ENGINEERING DATA

ITEM	REMARKS
MONITORING SYSTEMS	None.
MODIFICATIONS	Many changes discussed in files. Refer to Section 2.2 of this report.
HIGH POOL RECORDS	Maximum recorded pool at 8.17' over spillway in June, 1972 (Agnes). Refer to Plate V, Appendix E.
POST CONSTRUCTION ENGINEERING STUDIES & REPORTS	Inspection reports by PennDER.
PRIOR ACCIDENTS OR FAILURE OF DAM Description: Reports:	Breached 1889. Embankment crest 3 feet above spillway weir, overtopped by one foot. Embankment breached due to saturation after water receded.
MAINTENANCE & OPERATION RECORDS	None.
SPILLWAY PLAN, SECTIONS AND DETAILS	Plate III and IV, Appendix E.

ENGINEERING DATA

ITEM	REMARKS
OPERATING EQUIPMENT, PLANS & DETAILS	None.
CONSTRUCTION RECORDS	None.
PREVIOUS INSPECTION REPORTS & DEFICIENCIES	Inspection reports by PennDER indicating low embankment and trees on the embankment.
MISCELLANEOUS	

NDI NO. PA-01028

CHECK LIST
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: mostly farm land, some urban area, some forest

ELEVATION:

TOP NORMAL POOL & STORAGE CAPACITY: Elev. 451.3 Acre-Feet 33.8

TOP FLOOD CONTROL POOL & STORAGE CAPACITY: Elev. 457.5 Acre-Feet 589

MAXIMUM DESIGN POOL: Elev. 457.5 (460.1, with flood protection)

TOP DAM: Elev. 457.5

SPILLWAY:

a. Elevation 451.3

b. Type concrete, broad crested weir

c. Width 255 feet

d. Length --

e. Location Spillover right end of dam

f. Number and Type of Gates none

OUTLET WORKS:

a. Type none

b. Location

c. Entrance inverts

d. Exit inverts

e. Emergency drawdown facilities none

HYDROMETEOROLOGICAL GAGES:

a. Type none

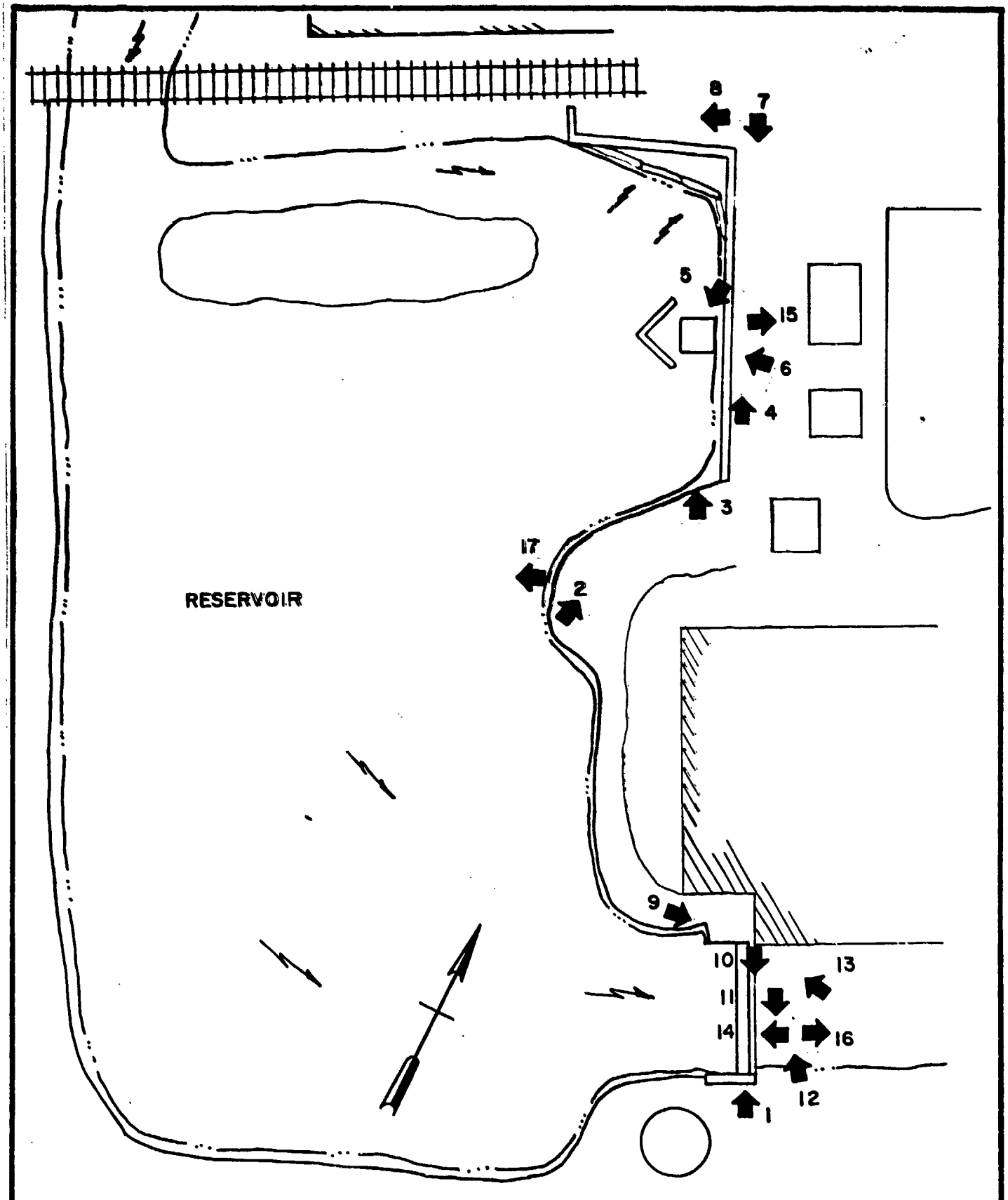
b. Location

c. Records

MAXIMUM NON-DAMAGING DISCHARGE: 17494 cfs (with flood protection)

APPENDIX C

PHOTOGRAPHS

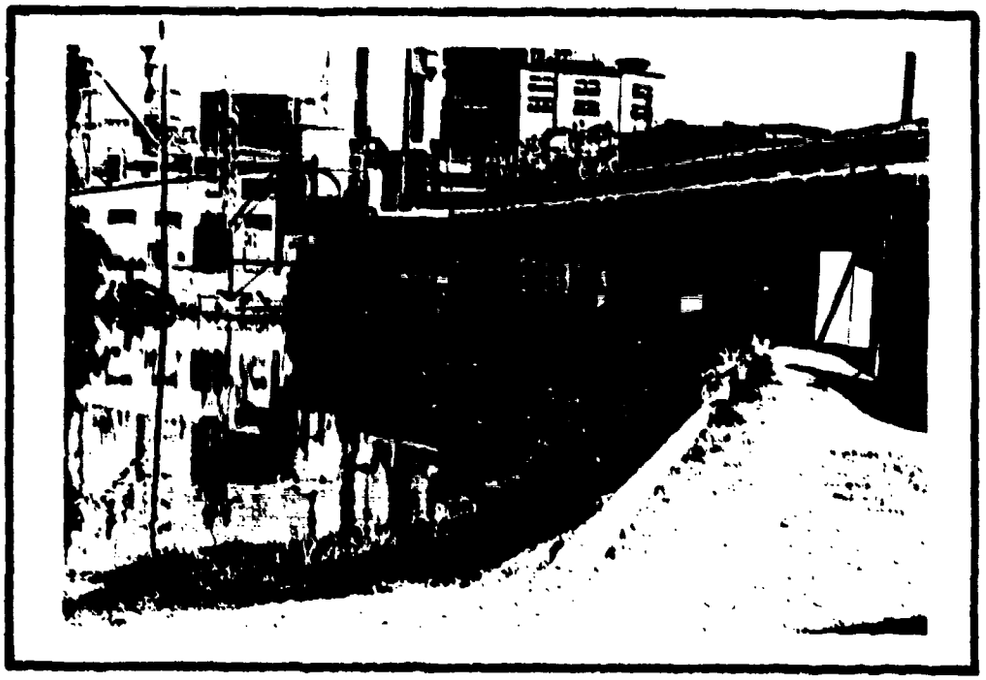


SPRING GROVE DAM

PA-01028

KEY MAP OF PHOTOGRAPHS

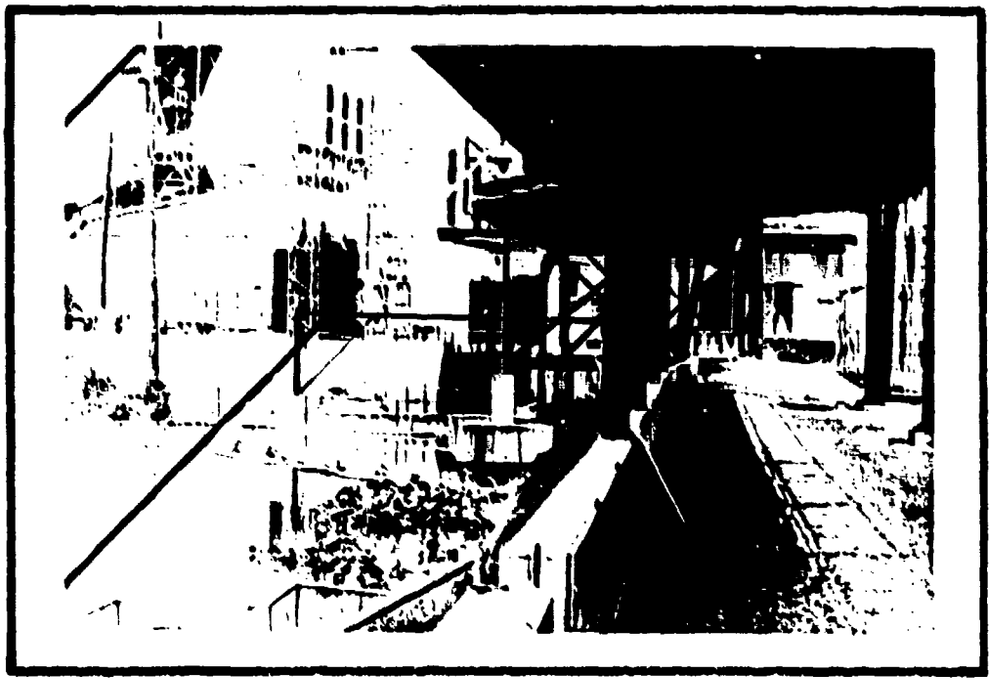
PLATE C-I



OVERVIEW LEFT EMBANKMENT - NO. 2
NOTE: CONCRETE WALL AND PIPELINES

LEFT EMBANKMENT AND PARAPET WALL - NO. 3
NOTE: BUILDING ON DOWNSTREAM SIDE

PA-01028
Plate C-II



PARAPET WALL AND CLOSURE OPENING - NO. 4

DETAIL OF VALVE CONTROLS - NO. 5

PA-01028
Plate C-III

CLOSURE OPENING IN WALL - NO. 6

VIEW OF PARAPET WALL AND EMBANKMENT - NO. 7
NOTE: EMBANKMENT AND BUILDING IN BACKGROUND

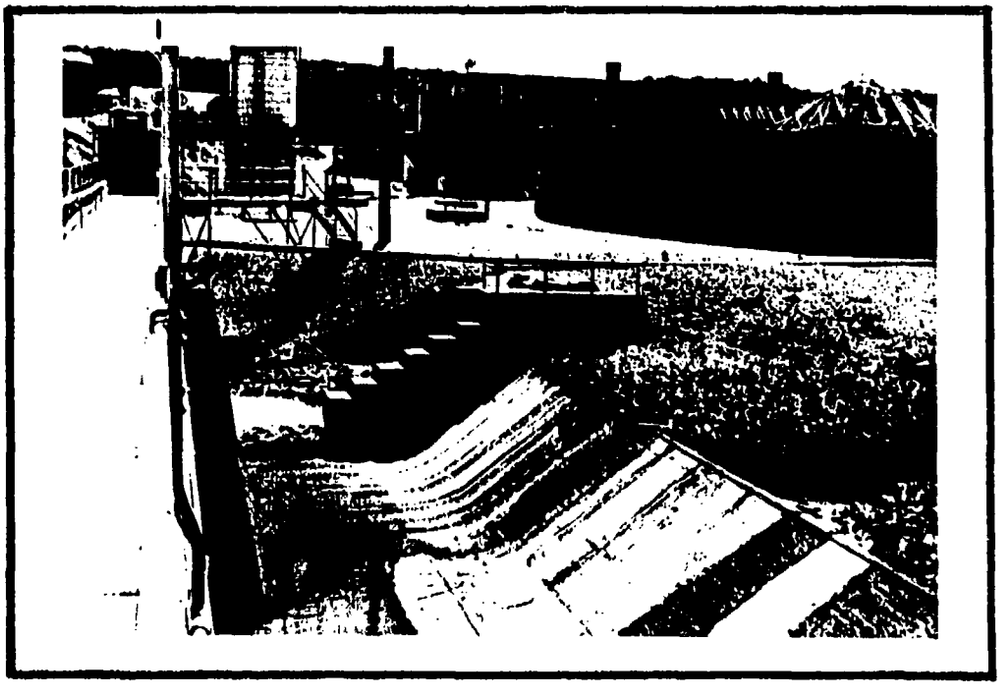
PA-01028
Plate C-IV

LOW AREA AT RAILROAD - NO. 8

WALL TIE-IN AT BUILDING AND SPILLWAY - NO. 9

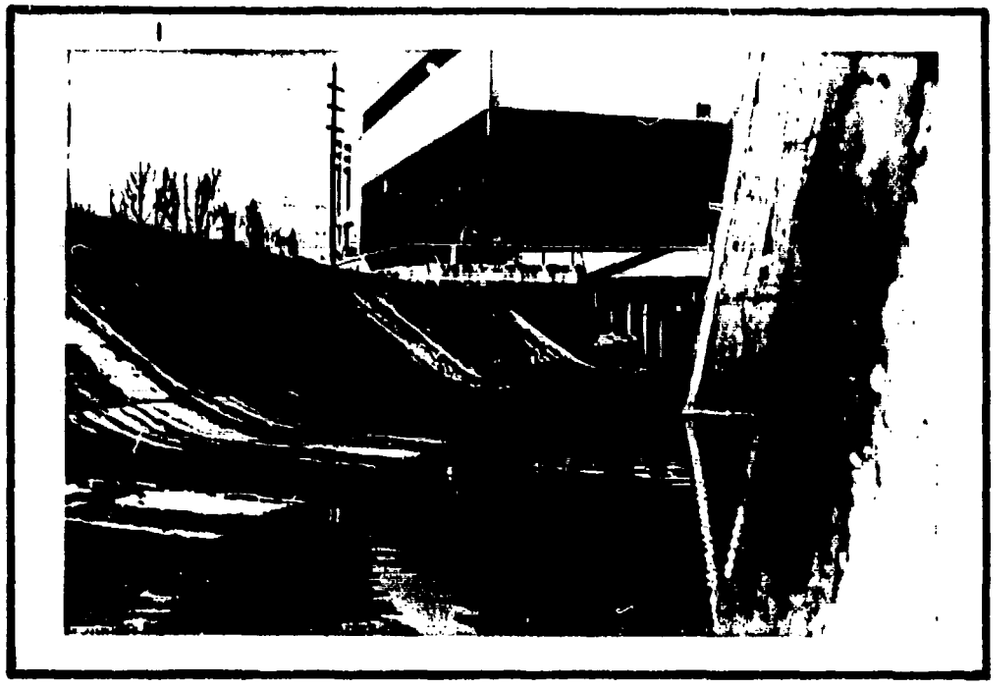
PA-01028
Plate -V

SPILLWAY FROM LEFT ABUTMENT - NO. 10
NOTE: DOWNSTREAM PIPE/FOOT BRIDGE

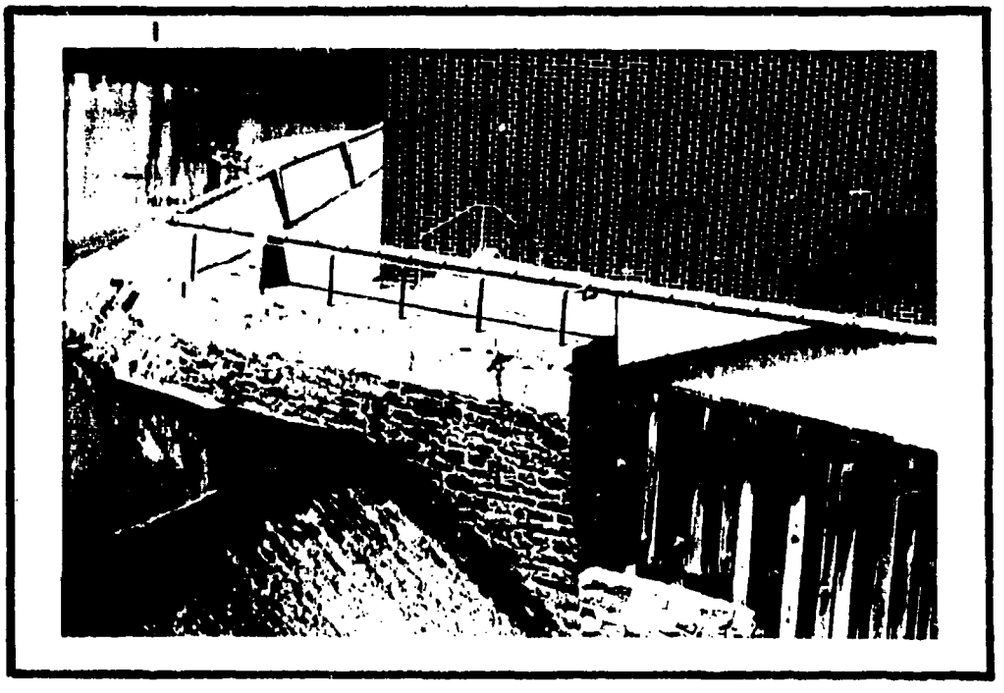


RIGHT ABUTMENT OF SPILLWAY - NO. 11

PA-01028
Plate C-VI

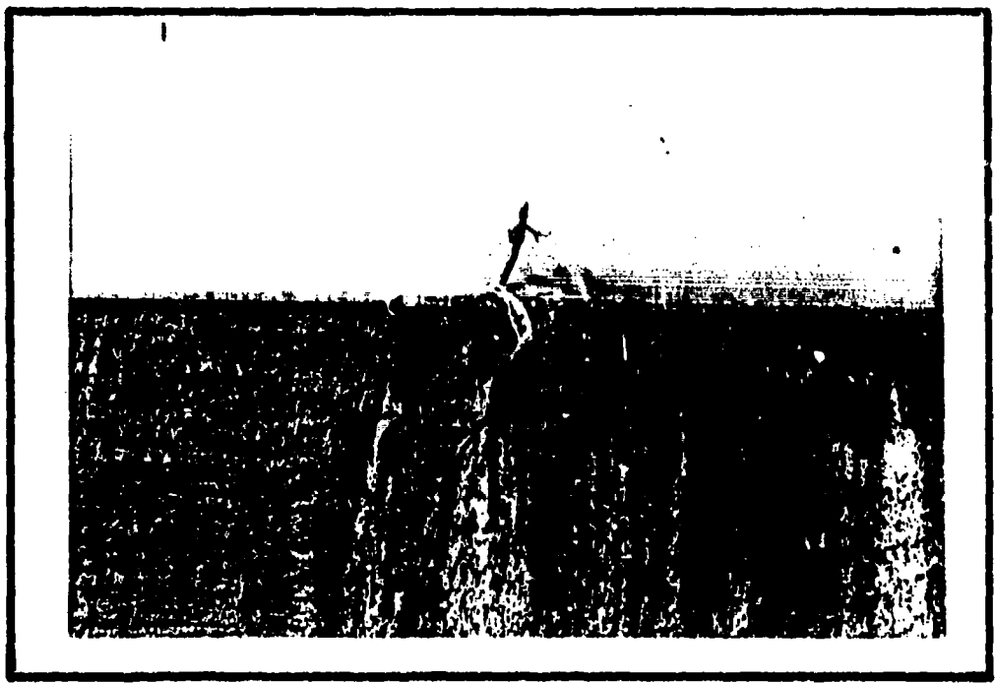


DOWNSTREAM FACE OF SPILLWAY - NO. 12



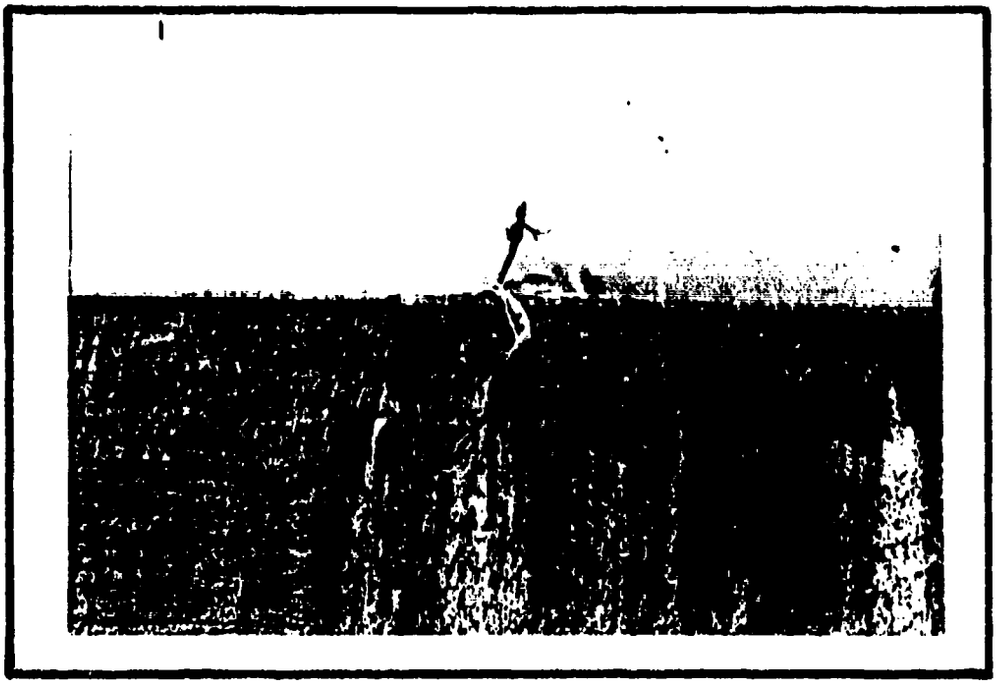
LEFT ABUTMENT OF SPILLWAY - NO. 13

PA-01028
Plate C-VII



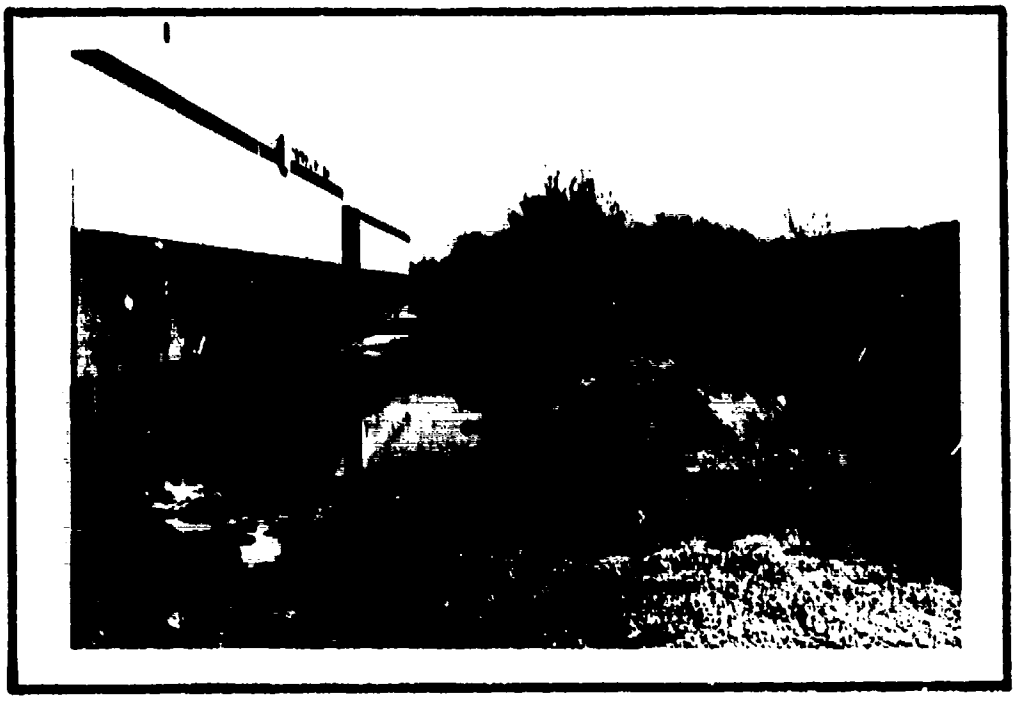
DETAIL OF DETERIORATED CONCRETE OF SPILLWAY - NO. 14

SETTLING POND DOWNSTREAM OF EMBANKMENT - NO. 15



DETAIL OF DETERIORATED CONCRETE OF SPILLWAY - NO. 14

SETTLING POND DOWNSTREAM OF EMBANKMENT - NO. 15



DOWNSTREAM CHANNEL OF SPILLWAY - NO. 16
NOTE: BUILDING ON PILE FOUNDATION

OVERVIEW OF RESERVOIR - NO. 17

APPENDIX D

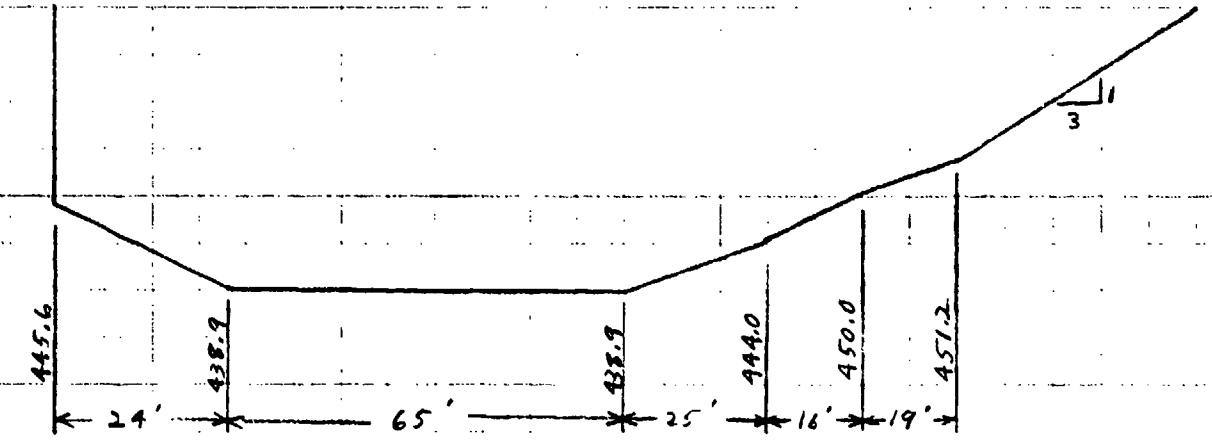
HYDROLOGY AND HYDRAULIC CALCULATIONS

BY RLS DATE 6/22/81 **BERGER ASSOCIATES** SHEET NO. 1 OF 7

CHKD. BY DATE PROJECT D-590

SUBJECT SPRING GROVE DAM

CHANNEL CAPACITY



$S = .0013$

$N = .045$

$$Q = 1.486 \times A \times R^{2/3} \times S^{1/2} / N$$

AT WEIR ELEV 451.3

$$Q = 1.486 \times 1292 \times (8.67)^{.67} \times (.0013)^{0.5} / .045$$

$$= 6492 \text{ CFS}$$

AT TOP OF DAM ELEV 457.5

$$Q = 1.486 \times 2272 \times (12.76)^{.67} \times (.0013)^{0.5} / .045$$

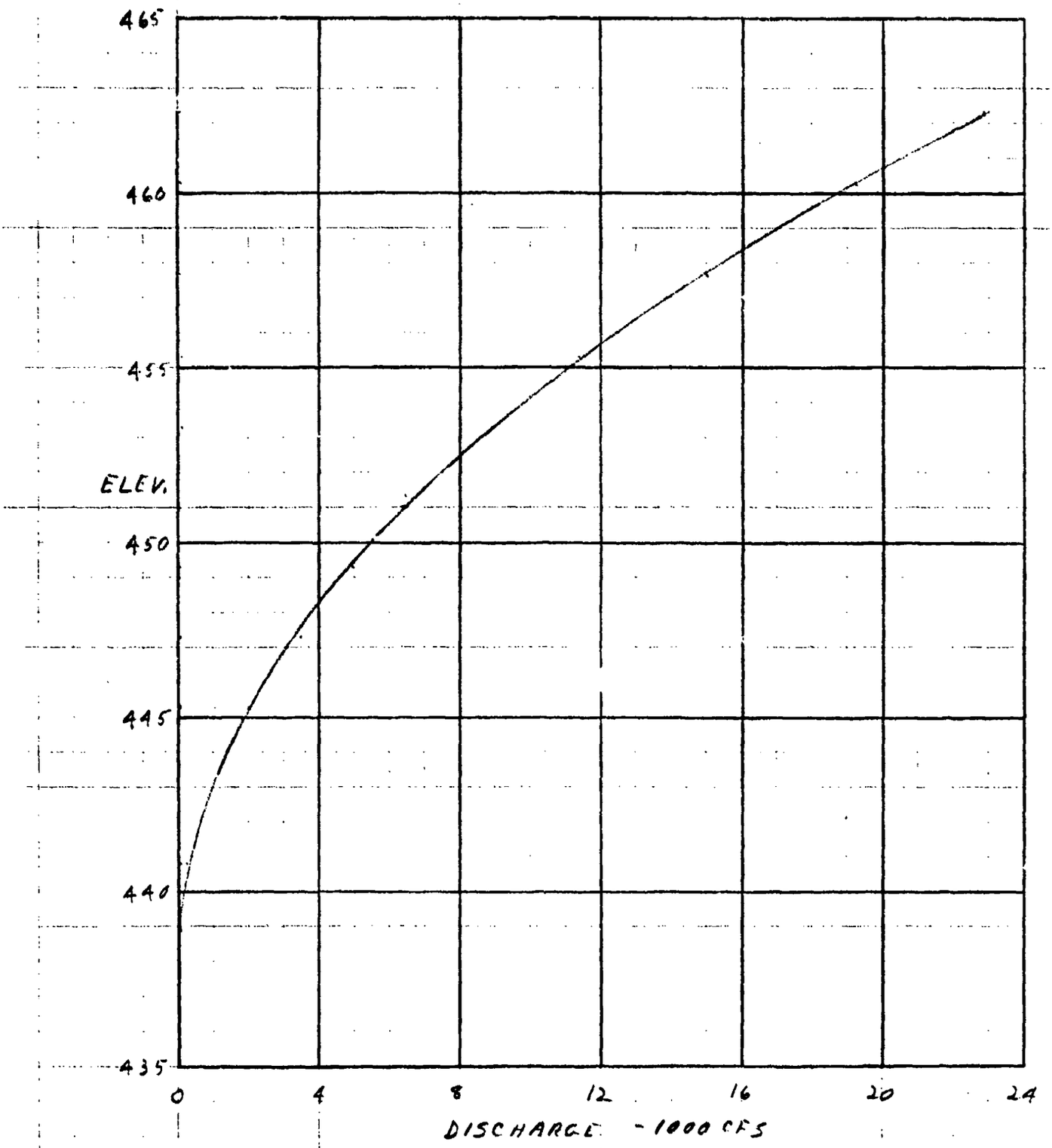
$$= 14771 \text{ CFS}$$

BY RLS DATE 6/22/81 **BERGER ASSOCIATES** SHEET NO. 2 OF 7

CHKD. BY ____ DATE ____ PROJECT D0590

SUBJECT SPRING GROVE DAM

CHANNEL CAPACITY CURVE

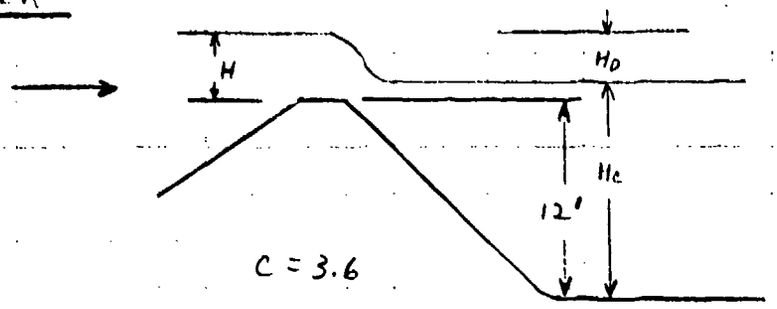


BY RLS DATE 6/22/81 | BERGER ASSOCIATES | SHEET NO. 3 OF 7

CHKD. BY ____ DATE ____ | PROJECT D0590

SUBJECT SPRING GROVE DAM

WEIR TAILWATER



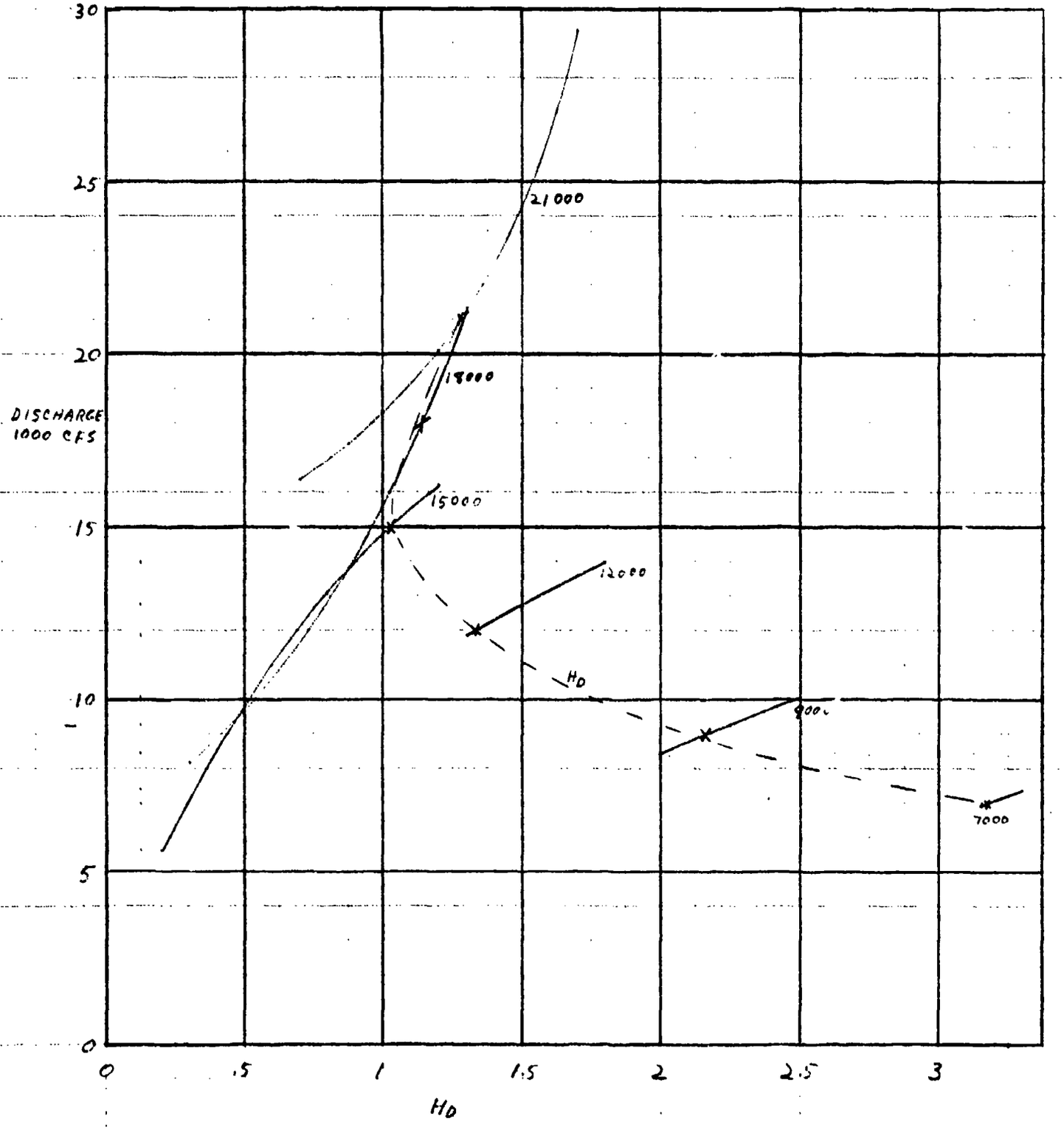
Q_A	H_c	H	H_D	H_D/H	C_W (SMALL DAMS FIG 254)	Q
7000	12.7	4	3.3	.825	3.6	7344
		3.85	3.15	.818	3.6	6935
9000	14.5	5	2.5	.5	3.53	10064
		4.5	2	.44	3.49	8495
		4.75	2.25	.47	3.51	9266
12000	16.7	6	1.3	.22	3.17	11880
		6.5	1.8	.28	3.31	13987
		6.2	1.5	.24	3.24	12755
15000	18.8	7	0.2	.03	1.19	5620
		8	1.2	.15	2.81	16214
		7.6	0.8	.11	2.45	13090
18000	20.7	9	0.3	.03	1.19	8193
		10	1.3	.13	2.63	21208
		9.7	1.0	.10	2.02	15561
21000	22.3	11	0.7	.06	1.76	16374
		12	1.7	.14	2.77	29362
		11.5	1.2	.10	2.02	20088

BY RLS DATE 6/22/81 **BERGER ASSOCIATES** SHEET NO. 4 OF 7

CHKD. BY DATE PROJECT D0590

SUBJECT SPRING GROVE DAM

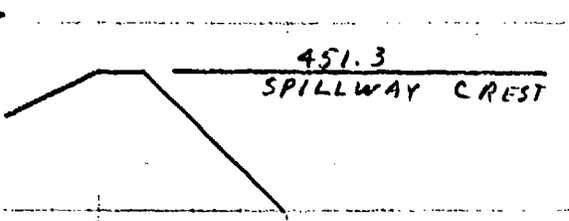
WEIR TAILWATER



USE MINIMUM H_D = 1.1

BY RLS DATE 6/23/81 **BERGER ASSOCIATES** SHEET NO. 5 OF 7
CHKD. BY DATE PROJECT 20590
SUBJECT SPRING GROVE DAM

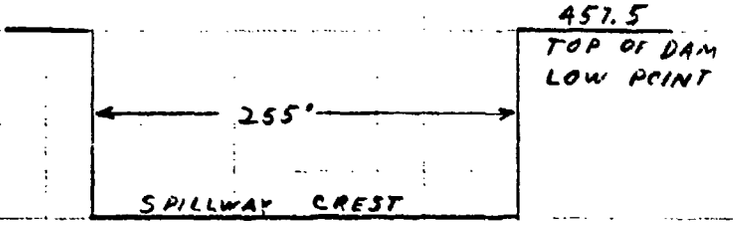
SPILLWAY CAPACITY



C = 3.6 (KING'S HOOK)

WEIR IS SUBMERGED BY DOWNSTREAM TAILWATER DUE TO CONTRACTING STREAM CHANNEL.

USE MINIMUM $H_0 = 1.1$ (FIG. 254, SMALL DAMS)



$H = 457.5 - 451.3 = 6.2'$

C_S/C FROM FIG. 254 SMALL DAMS

$Q = C_S/C \times C \times L \times H^{3/2}$

$= .83 \times 3.6 \times 255 \times (6.2)^{1.5}$

$= 11763$ CFS

AT ELEV. 460.1, FLOOD PROTECTION ELEVATION

$H = 460.1 - 451.3 = 8.8'$

$Q = C_S/C \times C \times L \times H^{3/2}$

$= .73 \times 3.6 \times 255 \times (8.8)^{1.5}$

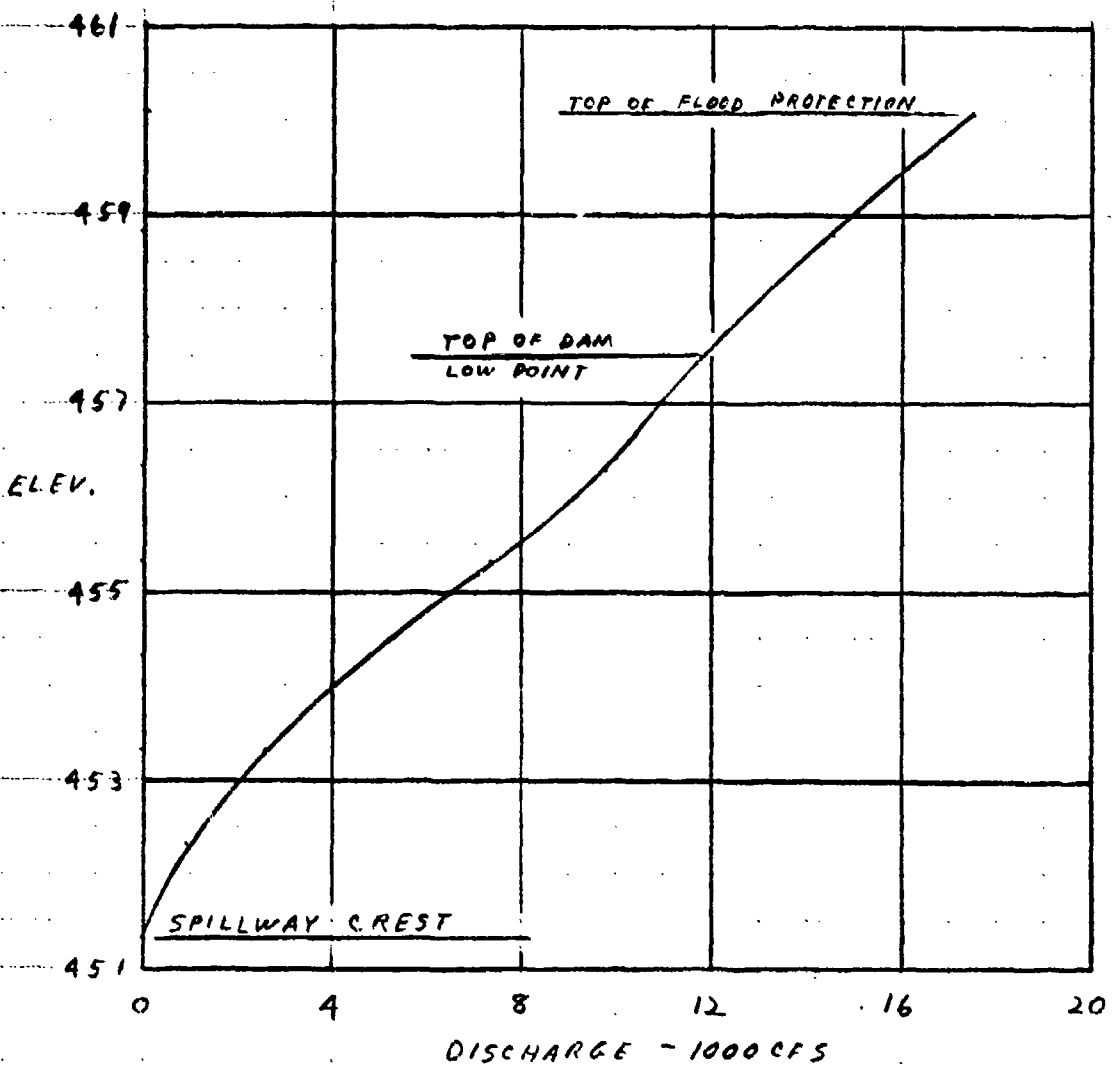
$= 17494$ CFS

BY BLS DATE 6/23/81 | BERGER ASSOCIATES | SHEET NO. 6 OF 7

CHKD. BY ____ DATE ____ | PROJECT 00590

SUBJECT SPRING GROVE DAM

SPILLWAY CAPACITY CURVE



STORAGE

33.8 AC-FT AT NORMAL POOL (451.3) (FROM PENNDER FILES)

PLANIMETERED AREA (QUAD SHEET): ELEV. 451.3 = 23 A.
ELEV. 460 = 245 A

INTERPOLATED AREA: ELEV 457.5 = 181 A

$$\text{STORAGE} = 33.8 + \left(6\tfrac{2}{3} \times \left(23 + 181 + (23 \times 181)^{0.5}\right)\right) = 589 \text{ AC-FT}$$

MAXIMUM KNOWN FLOOD AT DAMSITE

THE MAXIMUM KNOWN FLOOD AT MILL DAM OCCURRED IN JUNE 1972 WHEN THE DISCHARGE OVER THE SPILLWAY REACHED A DEPTH OF 98 INCHES. THIS FLOOD EVENT WAS RECORDED AS 19400 CFS AT THE STREAM GAGE LOCATED A SHORT DISTANCE DOWNSTREAM OF THE DAM. THE DAM WAS OVERTOPPED BY THIS FLOOD.

DESIGN FLOOD

SIZE CLASSIFICATION

MAXIMUM STORAGE = 589 ACRE-FEET
MAXIMUM HEIGHT = 18 FEET
SIZE CLASSIFICATION IS "SMALL"

HAZARD CLASSIFICATION

FACTORY LOCATED ON EMBANKMENT AND AT DOWNSTREAM TOE.
USE "SIGNIFICANT"

RECOMMENDED SPILLWAY DESIGN FLOOD

THE ABOVE CLASSIFICATIONS INDICATE USE OF AN SDF EQUAL TO THE 100 YEAR FLOOD TO ONE-HALF THE PROBABLE MAXIMUM FLOOD.

```
1TT     SPRING GROVE DAM   ****   CODORUS CREEK
 TT     SPRING GROVE BOROUGH, YORK COUNTY, PA.
 TT     NDI # 01028   ****   PA DER # 67-4
 ID  STATION 01574500    CODORUS CREEK AT SPRING GROVE, PA.    1930 - 1979
 GS  5745              .47
 QR  5745   1931    1710
 QR  5745   1932     695
 QR  5745   1933    1620
 QR  5745   1934   11200
 QR  5745   1935    6070
 QR  5745   1936    1010
 QR  5745   1937    1380
 QR  5745   1938    2210
 QR  5745   1939    3180
 QR  5745   1940    1620
 QR  5745   1941    6190
 QR  5745   1942     870
 QR  5745   1943    3190
 QR  5745   1944    5510
 QR  5745   1945    2650
 QR  5745   1946    2820
 QR  5745   1947    3850
 QR  5745   1948    1430
 QR  5745   1949    1810
 QR  5745   1950    1730
 QR  5745   1951    1610
 QR  5745   1952    4080
 QR  5745   1953    1750
 QR  5745   1954    2180
 QR  5745   1955    1910
 QR  5745   1956    3180
 QR  5745   1957    1910
 QR  5745   1958    1100
 QR  5745   1959    2180
 QR  5745   1960    1060
 QR  5745   1961    1310
 QR  5745   1962    1610
 QR  5745   1963    1950
 QR  5745   1964    2140
 QR  5745   1965    2020
 QR  5745   1966    1600
 QR  5745   1967    1810
 QR  5745   1968    1640
 QR  5745   1969     691
 QR  5745   1970    1910
 QR  5745   1971    1960
 QR  5745   1972   19400
 QR  5745   1973     807
 QR  5745   1974    1290
 QR  5745   1975   10700
 QR  5745   1976    1340
 QR  5745   1977    1620
 QR  5745   1978    3050
 QR  5745   1979    2500
 ED
    0
*WEOF
1**********************************
 * FLOOD FLOW FREQUENCY ANALYSIS *
 * PRELIMINARY ----OCTOBER 1976  *
 **********************************
```

```
X   X   XXX   XXXXX XXX  XXX XXXXX      XXXXX  XXX       X   X  XXX  XXXXX XXXX   XXX
XX  X X   X    X    X X    X            X   X   X       X   X X     X     X   X X
X X X X   X    X    X X    XXX          X   X   X       X   X  XXX  XXX   XXXX   XXX
X  XX X   X    X    X X    X            X   X   X       X   X     X X     X  X      X
X   X  XXX     X     XXX  XXX XXXXX      X    XXX        XXX   XXX  XXXXX X   X  XXX
```

1. THE WATER RESOURCES COUNCIL'S WORKGROUP ON FLOOD FLOW FREQUENCY ANALYSIS IS REVISING THE PROCEDURE FOR ADOPTING SKEW COEFFICIENTS FOR ANALYSES INVOLVING HIGH OUTLIERS AND/OR HISTORIC EVENTS. THE PROCEDURE WILL NOT BE AVAILABLE UNTIL DECEMBER 1976 AT THE EARLIEST

2. WHEN HIGH OUTLIERS OR HISTORIC EVENTS ARE PRESENT THIS VERSION OF THE PROGRAM WILLO

   A. CALCULATE HISTORICALLY WEIGHTED STATISTICS ACCORDING TO EQUATIONS 6-1,6-2A,6-3A,6-4A CONTAINED IN APPENDIX 6 OF THE WRC GUIDELINES

   B. THEN, THE HISTORICALLY WEIGHTED SKEW DETERMINED FROM EQUATION 6-4A IS WEIGHTED WITH GENERALIZED SKEW TO YIELD THE FINAL ADOPTED SKEW ACCORDING TO THE PROCEDURES DISCUSSED ON PAGE 11 OF THE WRC GUIDELINES

3. IF THE WORKGROUP ADOPTS A PROCEDURE DIFFERENT THAN THE ONE CONTAINED WITHIN THIS PROGRAM, THEN STUDIES INCLUDING HISTORIC OR HIGH OUTLIER ADJUSTMENTS WILL NOT BE IN ACCORDANCE WITH THE WRC GUIDELINES

4. ANY REVISIONS IN PROCEDURES WILL BE PROGRAMMED AND PROVIDED AS A PROGRAM MODIFICATION

```
1**********************************
 * FLOOD FLOW FREQUENCY ANALYSIS *
 * PRELIMINARY ---- OCTOBER 1976 *
 **********************************
0
0**TITLE CARD(S)**
 TT       SPRING GROVE DAM   ****   CODORUS CREEK
 TT       SPRING GROVE BOROUGH, YORK COUNTY, PA.
 TT       NDI # 01028   ****   PA DER # 67-4
0**STATION IDENTIFICATION**
 ID    STATION 01574500    CODORUS CREEK AT SPRING GROVE, PA.     1930 - 1979
0**GENERALIZED SKEW**
 GS          .47
0**SYSTEMATIC FLOOD PEAKS**
 QR    49 QR CARDS SUPPLIED
0**END OF INPUT DATA**
 ED ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
```

FINAL RESULTS

-ANNUAL PEAKS - STATION 01574500 CODORUS CREEK AT SPRING

DATA ANALYZED				ORDERED DATA			
MON	DAY	YEAR	FLOW	RANK	WATER YEAR	FLOW	WEIBULL PLOT POS
0	0	1931	1710.	1	1972	19400.	.0200
0	0	1932	685.	2	1934	11200.	.0400
0	0	1933	1620.	3	1975	10700.	.0600
0	0	1934	11200.	4	1941	6190.	.0800
0	0	1935	6070.	5	1935	6070.	.1000
0	0	1936	1010.	6	1944	5510.	.1200
0	0	1937	1380.	7	1952	4080.	.1400
0	0	1938	2210.	8	1947	3850.	.1600
0	0	1939	3180.	9	1943	3190.	.1800
0	0	1940	1620.	10	1939	3180.	.2000
0	0	1941	6190.	11	1956	3180.	.2200
0	0	1942	870.	12	1978	3050.	.2400
0	0	1943	3190.	13	1946	2820.	.2600
0	0	1944	5510.	14	1945	2650.	.2800
0	0	1945	2650.	15	1979	2500.	.3000
0	0	1946	2820.	16	1938	2210.	.3200
0	0	1947	3850.	17	1954	2180.	.3400
0	0	1948	1430.	18	1959	2180.	.3600
0	0	1949	1810.	19	1964	2140.	.3800
0	0	1950	1730.	20	1965	2020.	.4000
0	0	1951	1610.	21	1971	1960.	.4200
0	0	1952	4080.	22	1963	1950.	.4400
0	0	1953	1750.	23	1955	1910.	.4600
0	0	1954	2180.	24	1957	1910.	.4800
0	0	1955	1910.	25	1970	1910.	.5000
0	0	1956	3180.	26	1949	1810.	.5200
0	0	1957	1910.	27	1967	1810.	.5400
0	0	1958	1100.	28	1953	1750.	.5600
0	0	1959	2180.	29	1950	1730.	.5800
0	0	1960	1060.	30	1931	1710.	.6000
0	0	1961	1310.	31	1968	1640.	.6200
0	0	1962	1610.	32	1940	1620.	.6400
0	0	1963	1950.	33	1933	1620.	.6600
0	0	1964	2140.	34	1977	1620.	.6800
0	0	1965	2020.	35	1962	1610.	.7000
0	0	1966	1600.	36	1951	1610.	.7200
0	0	1967	1810.	37	1966	1600.	.7400
0	0	1968	1640.	38	1948	1430.	.7600
0	0	1969	691.	39	1937	1380.	.7800
0	0	1970	1910.	40	1976	1340.	.8000
0	0	1971	1960.	41	1961	1310.	.8200
0	0	1972	19400.	42	1974	1290.	.8400
0	0	1973	807.	43	1958	1100.	.8600
0	0	1974	1290.	44	1960	1060.	.8800
0	0	1975	10700.	45	1936	1010.	.9000
0	0	1976	1340.	46	1942	870.	.9200
0	0	1977	1620.	47	1973	807.	.9400
0	0	1978	3050.	48	1969	691.	.9600
0	0	1979	2500.	49	1932	685.	.9800

0 LOW OUTLIER(S) IDENTIFIED BELOW TEST VALUE OF 335.7

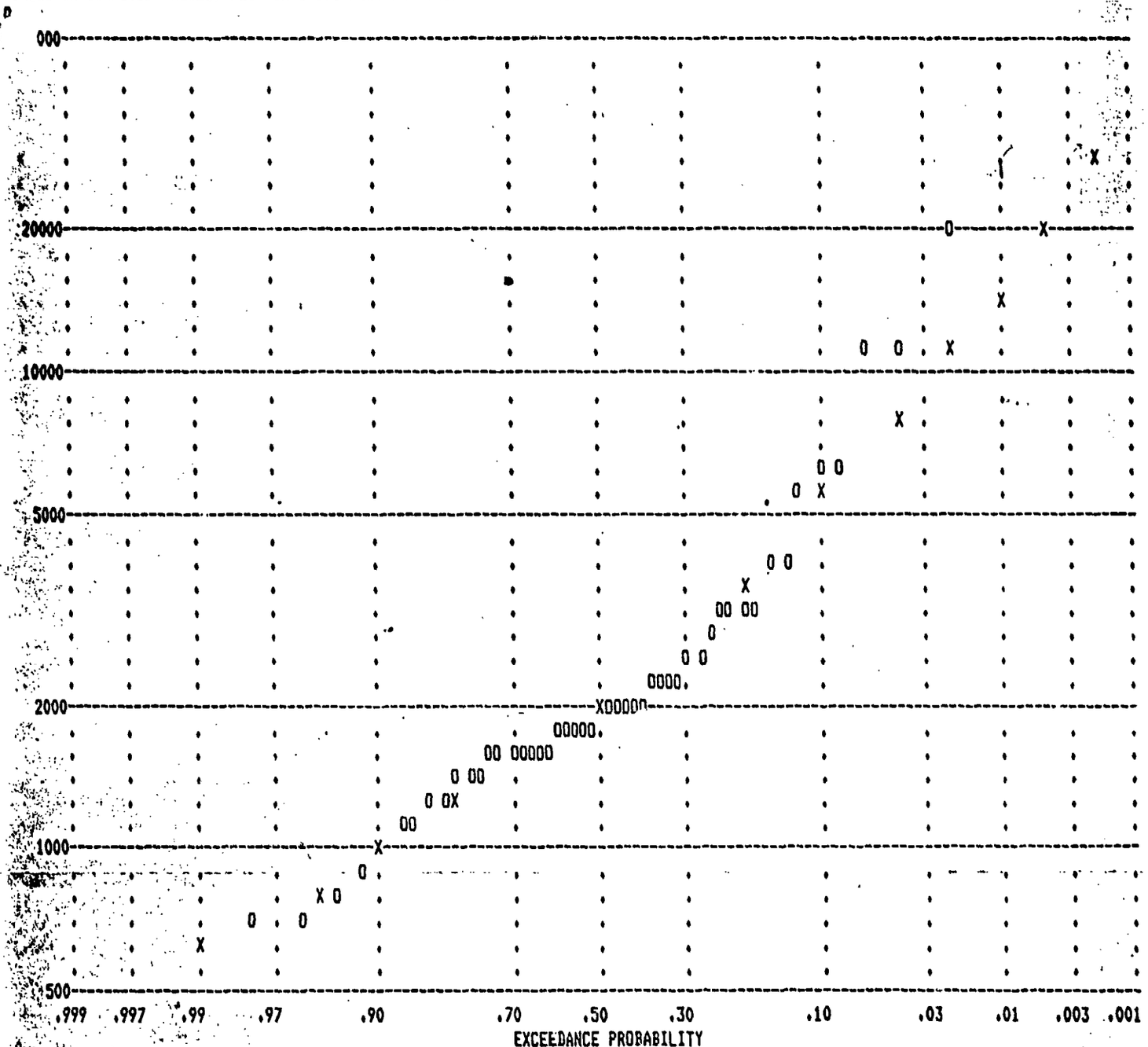
FINAL RESULTS

-FREQUENCY CURVE- STATION 01574500 CODORUS CREEK AT SPRING

PEAK FLOWS		EXCEEDANCE	CONFIDENCE LIMITS	
COMPUTED	EXPECTED PROBABILITY	PROBABILITY	.05 LIMIT	.95 LIMIT
27500.	33900.	.002	47400.	18500.
19400.	22600.	.005	31400.	13700.
14800.	16600.	.010	22700.	10800.
11100.	12100.	.020	16200.	8390.
8220.	8680.	.040	11400.	6430.
5320.	5480.	.100	6860.	4360.
3670.	3720.	.200	4500.	3090.
1970.	1970.	.500	2320.	1670.
1190.	1180.	.800	1420.	964.
950.	937.	.900	1150.	748.
806.	789.	.950	991.	620.
620.	599.	.990	783.	457.

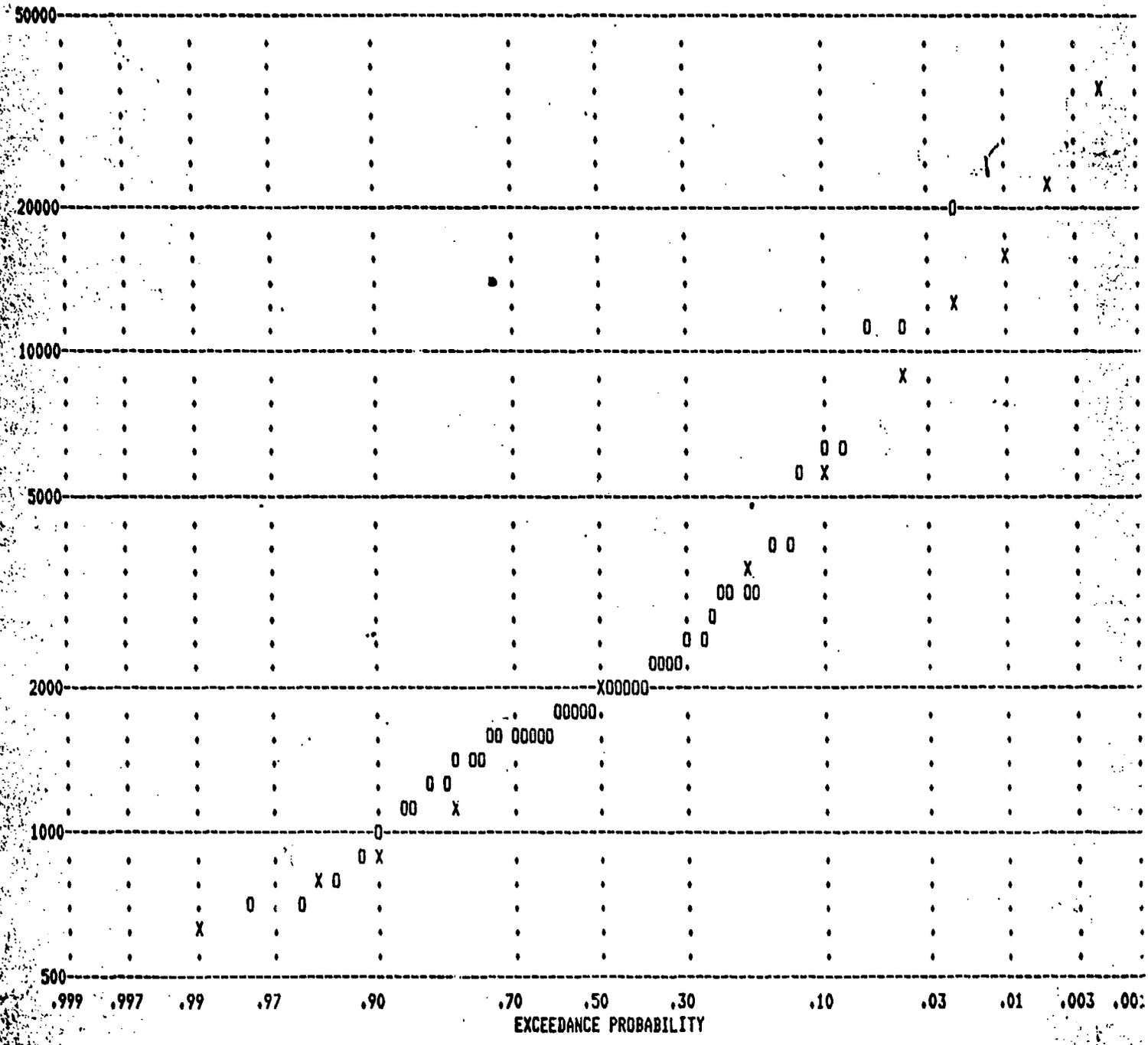
FREQUENCY CURVE STATISTICS		STATISTICS BASED ON	
MEAN LOGARITHM	3.3298	SYSTEMATIC DATA	49
STANDARD DEVIATION	.2974	HISTORIC EVENTS	0
COMPUTED SKEW	1.1553	HIGH OUTLIERS	0
GENERALIZED SKEW	.4700	LOW OUTLIERS	0
ADOPTED SKEW	.7000	ZERO OR MISSING	0
		TOTAL PERIOD,YEARS	49

FINAL RESULTS
-FREQUENCY PLOT - STATION 01574500 CODORUS CREEK AT SPRING GROVE, PA. 1930 - 1979
BASED ON COMPUTED VALUES, FLOW IN CUBIC FEET PER SECOND



LEGEND - O=OBSERVED VALUE, H=HIGH OUTLIER OR HISTORIC VALUE, L=LOW OUTLIER, X=COMPUTED CURVE

FINAL RESULTS
FREQUENCY PLOT - STATION 01574500 CODORUS CREEK AT SPRING GROVE, PA. 1930 - 1979
BASED ON EXPECTED PROBABILITY ADJUSTMENT, FLOW IN CUBIC FEET PER SECOND



LEGEND - O=OBSERVED VALUE, H=HIGH OUTLIER OR HISTORIC VALUE, L=LOW OUTLIER, X=COMPUTED CURVE

R

++++++++++

END OF RUN

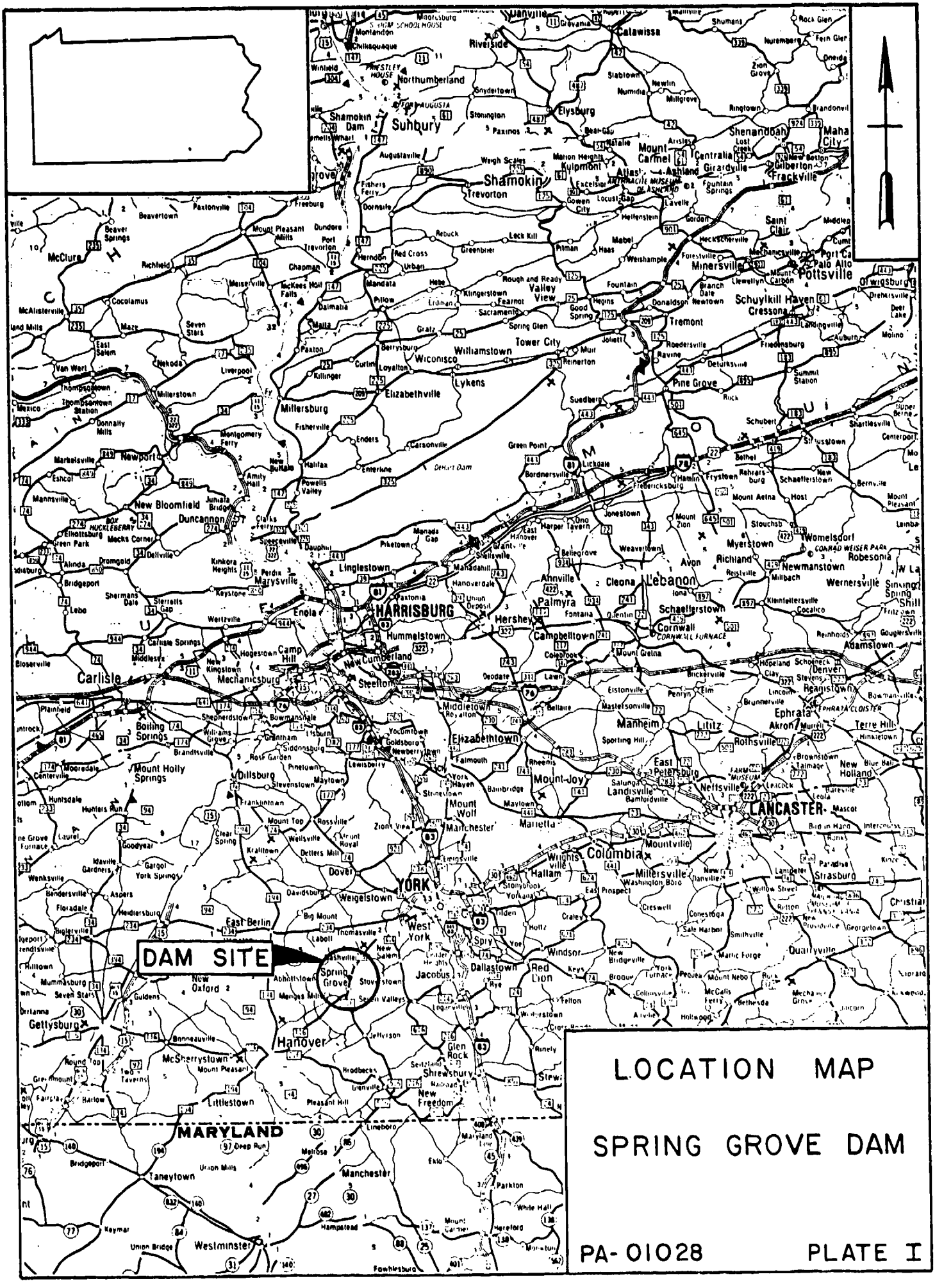
++++++++++

EOI ENCOUNTERED.

ND

APPENDIX E

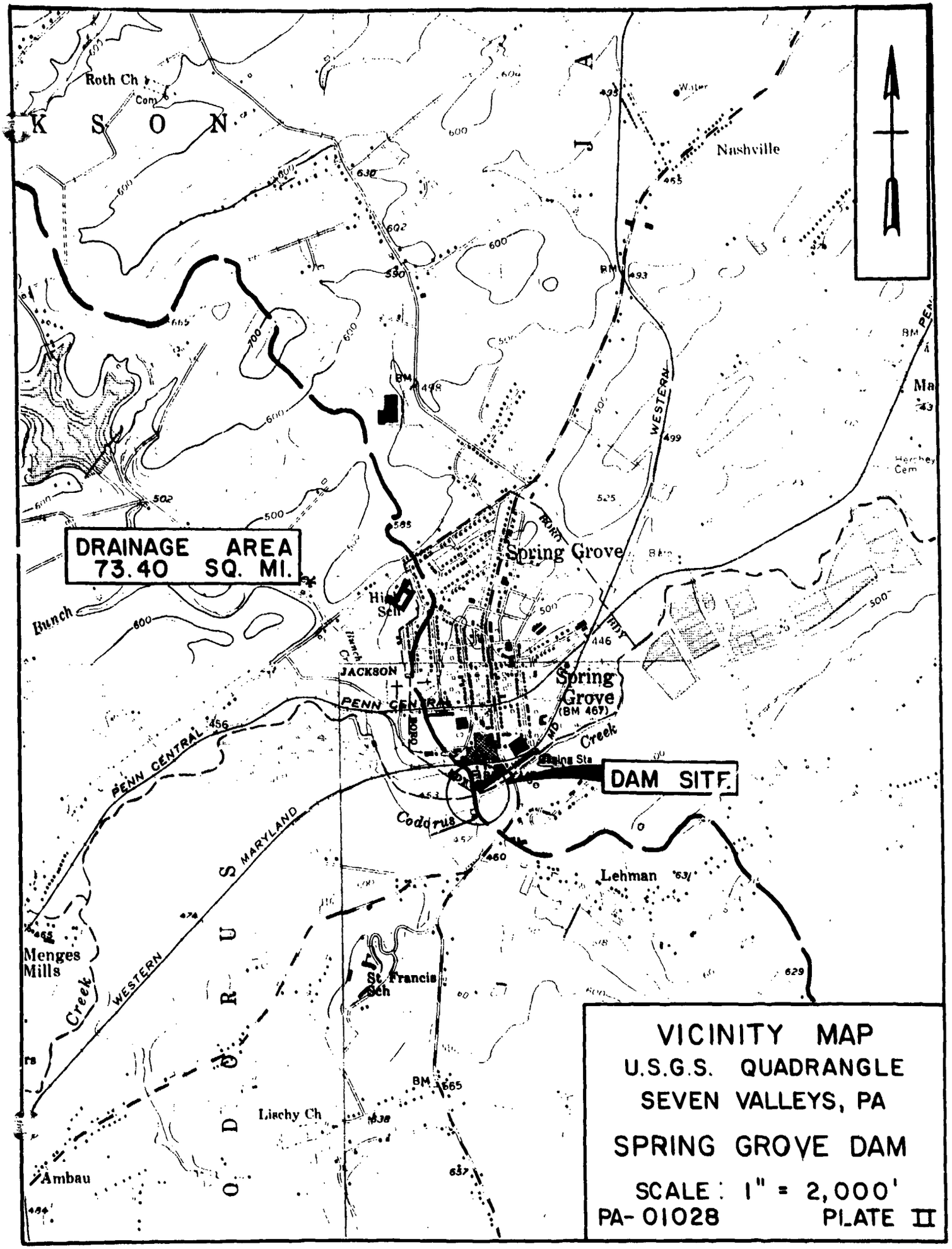
PLATES

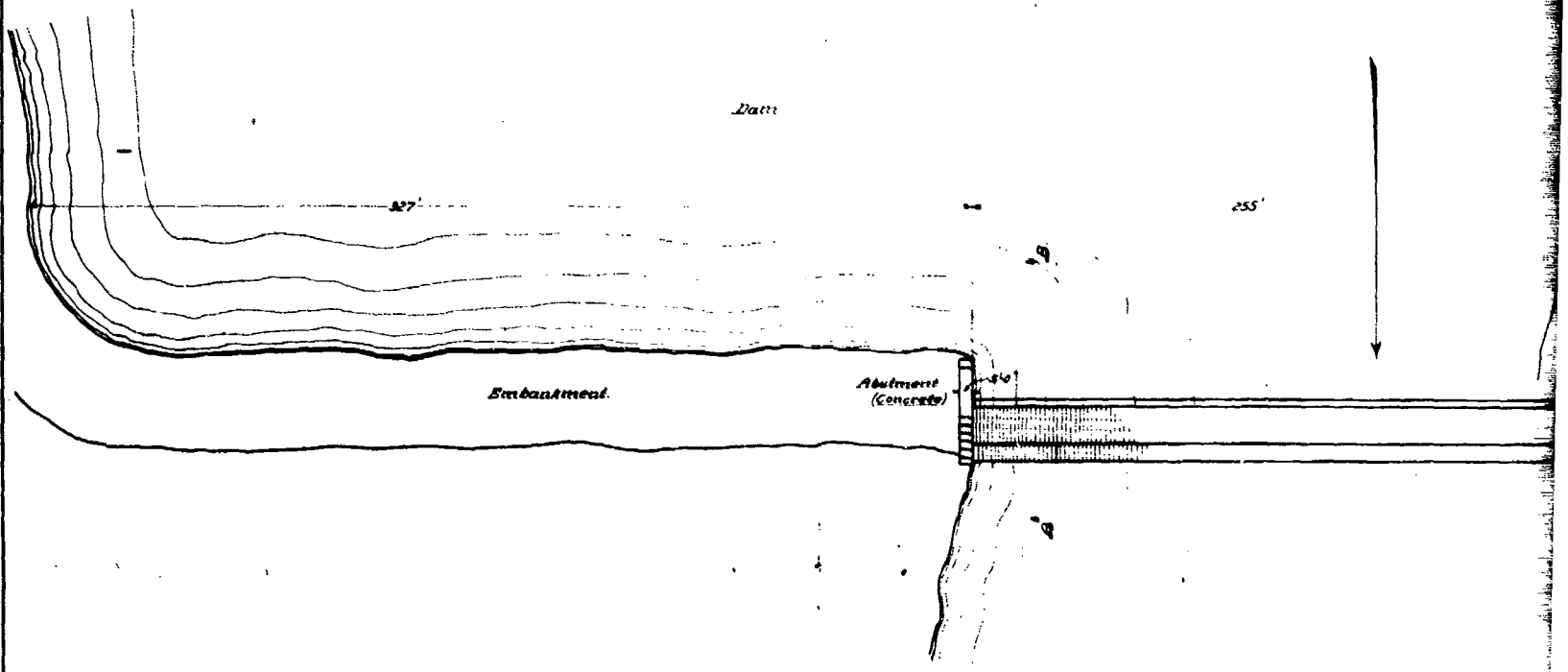


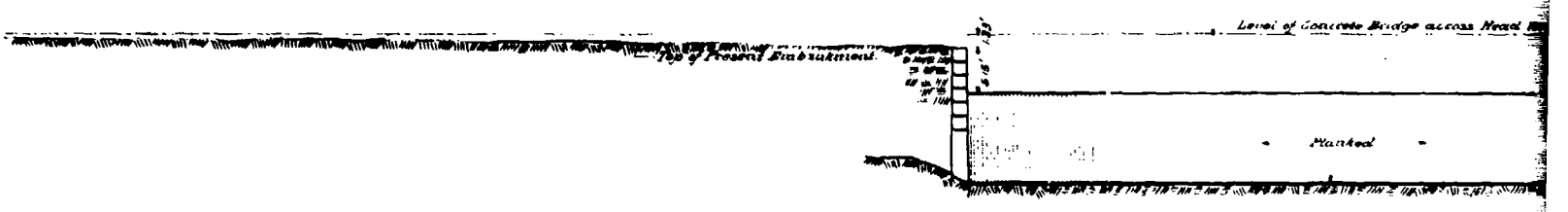
LOCATION MAP

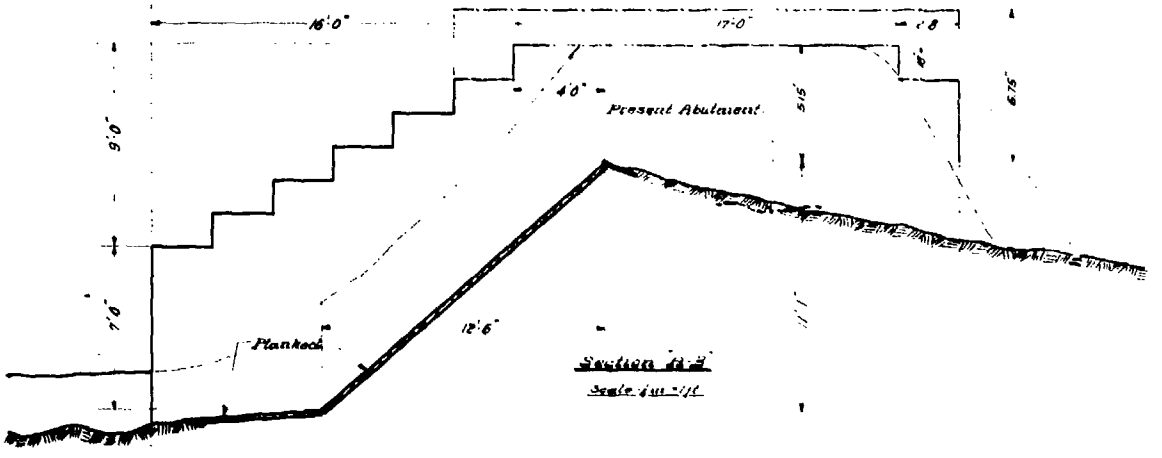
SPRING GROVE DAM

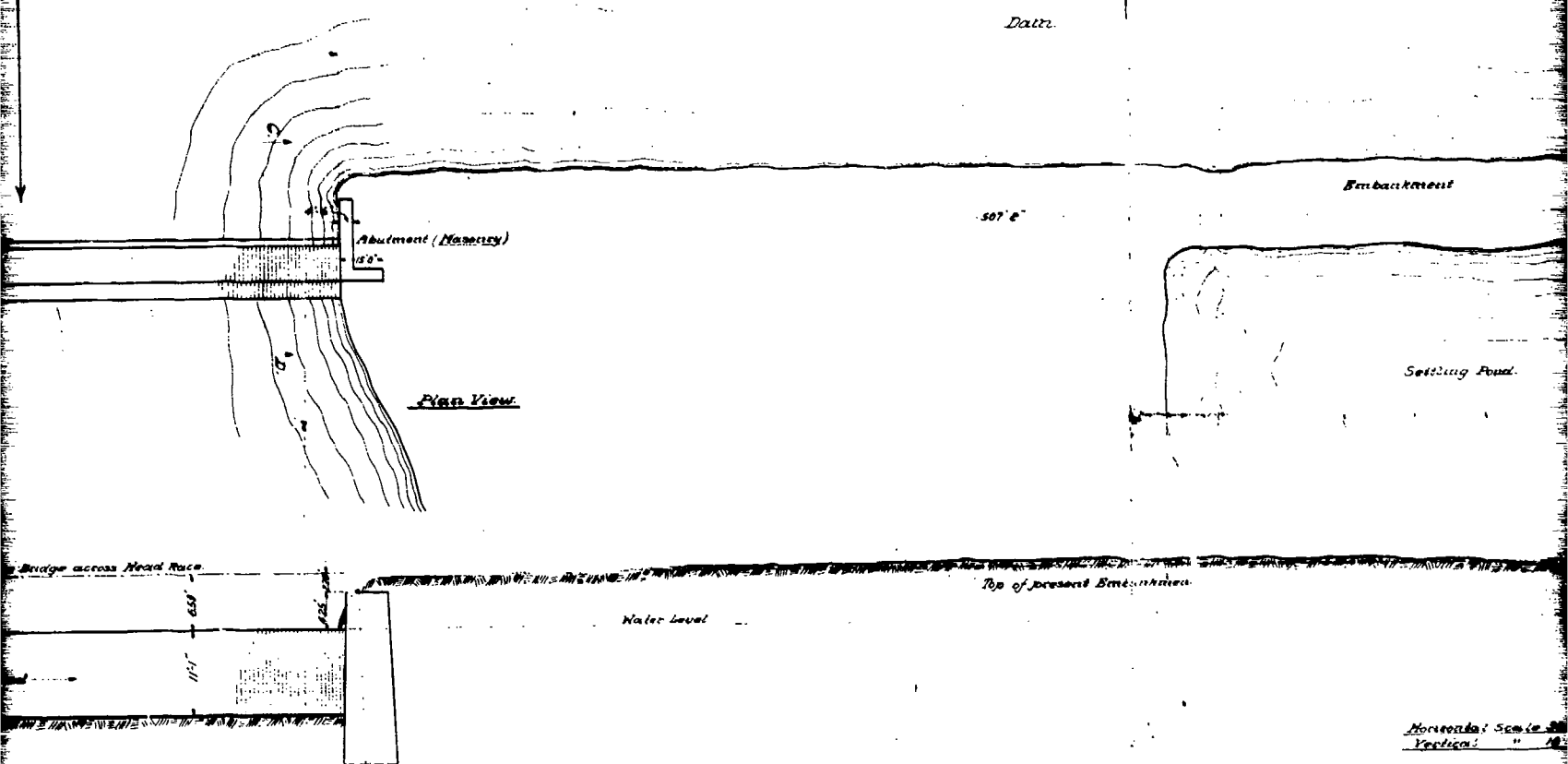
PA-01028 PLATE I


DRAINAGE AREA
73.40 SQ. MI.
DAM SITE
Spring Grove
Spring Grove (BM 467)
Nashville
Roth Ch
Bunch
JACKSON
PENN CENTRAL
WESTERN MARYLAND
Codorus Creek
Menges Mills
Lehman
St. Francis Sch
Lischy Ch
Ambau
BM 665
BM 498
BM 493
VICINITY MAP
U.S.G.S. QUADRANGLE
SEVEN VALLEYS, PA
SPRING GROVE DAM
SCALE: 1" = 2,000'
PA-01028
PLATE II


Dam
327'
255'
Embankment
Abutment (Concrete)
B
B'


Top of Present Embankment
Level of Concrete Bridge access Head
Planked

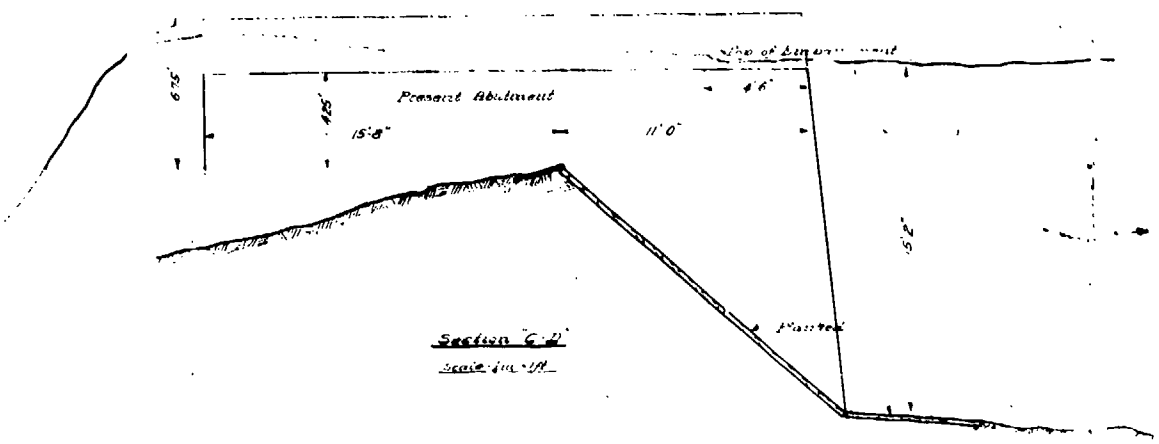

16'0"
17'0"
40'
Present Abutment
9'0"
7'0"
Planked
12'6"
Section "B-B'"
Scale 1/16" = 1'0"



Elevation. (Section thru Embankment)

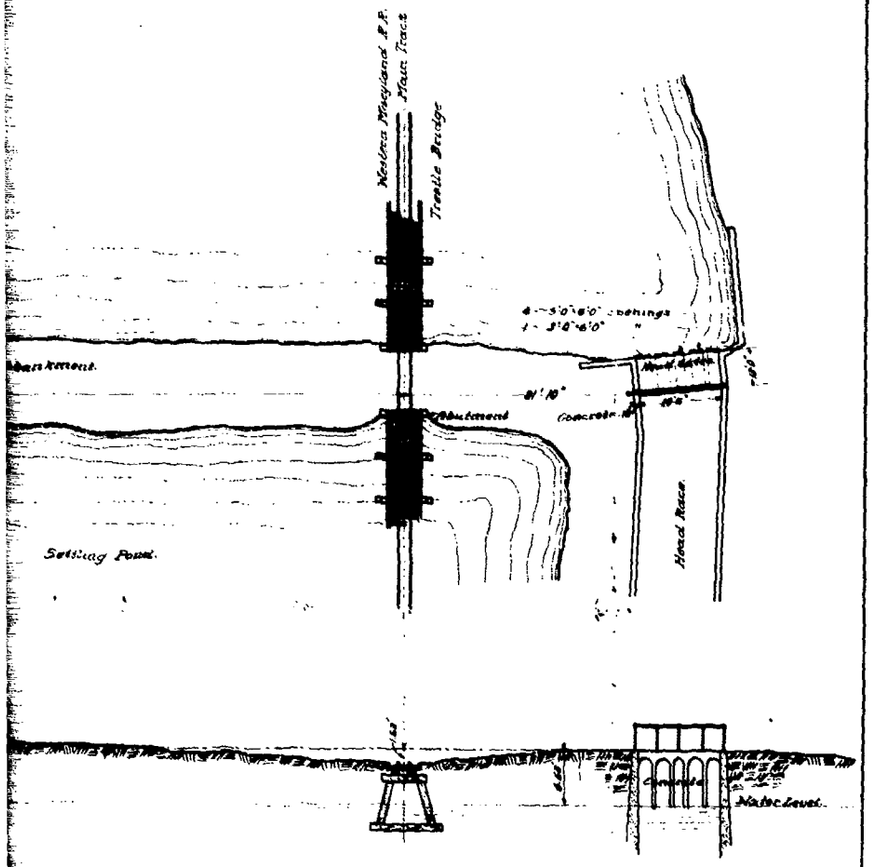
Horizontal Scale
Vertical " "

Heavy lines show
Lot & Dash " "



Section C-D
Scale 1in. = 10ft.

12



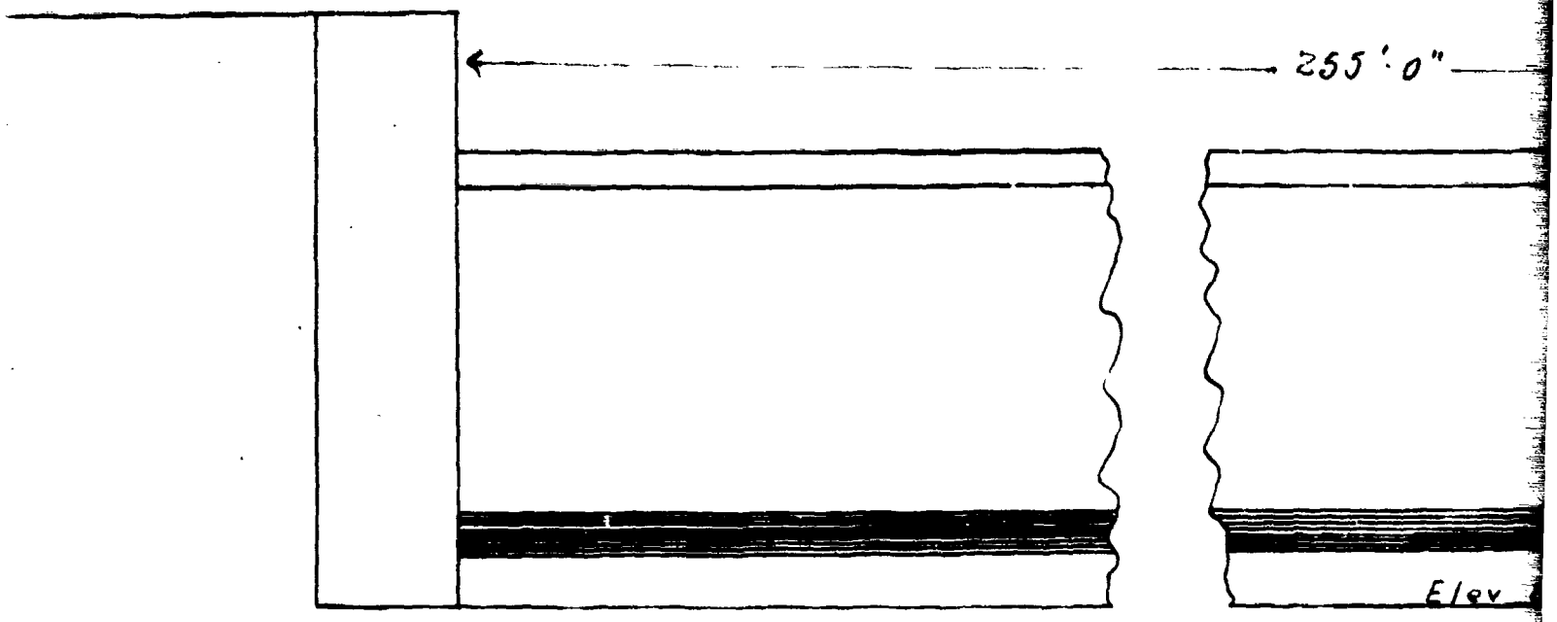
Horizontal Scale 30 ft = 1 in.
Vertical " 10 " = 1 in.

Heavy lines show present elevations.
Dash " " proposed "

Plan of Dam
across N branch of Cedarus Creek
P.H. Glatfelter Co.
Spring Grove Pa.
Nov 22 1911.

PLATE III
PA-01028

13

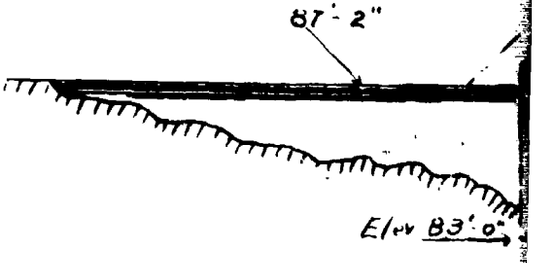


Elev. and Face of Dam Breast

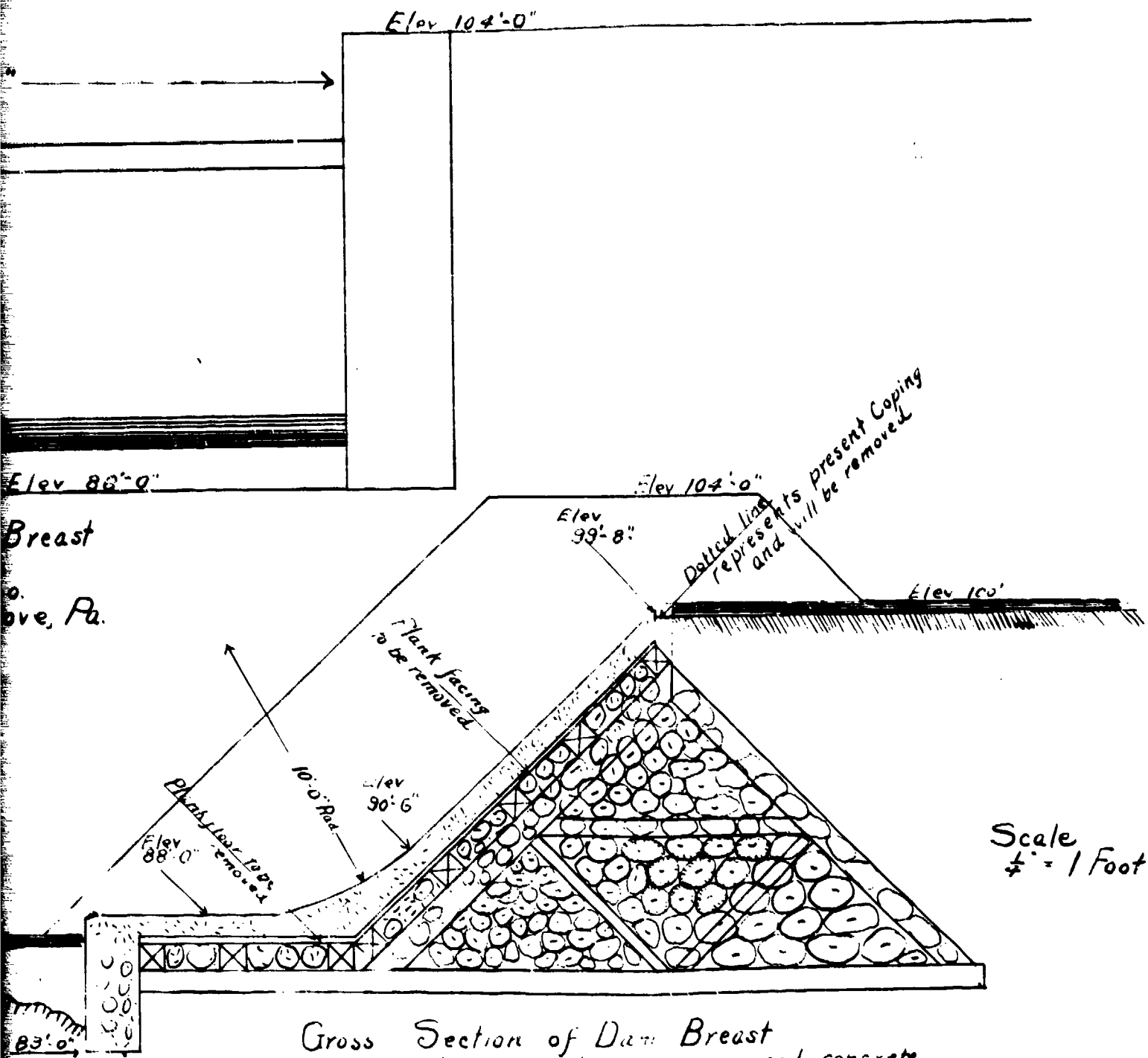
for

The P. H. Glatfelter Co.

Spring Grove, P



West



Breast

o.
ove, Pa.

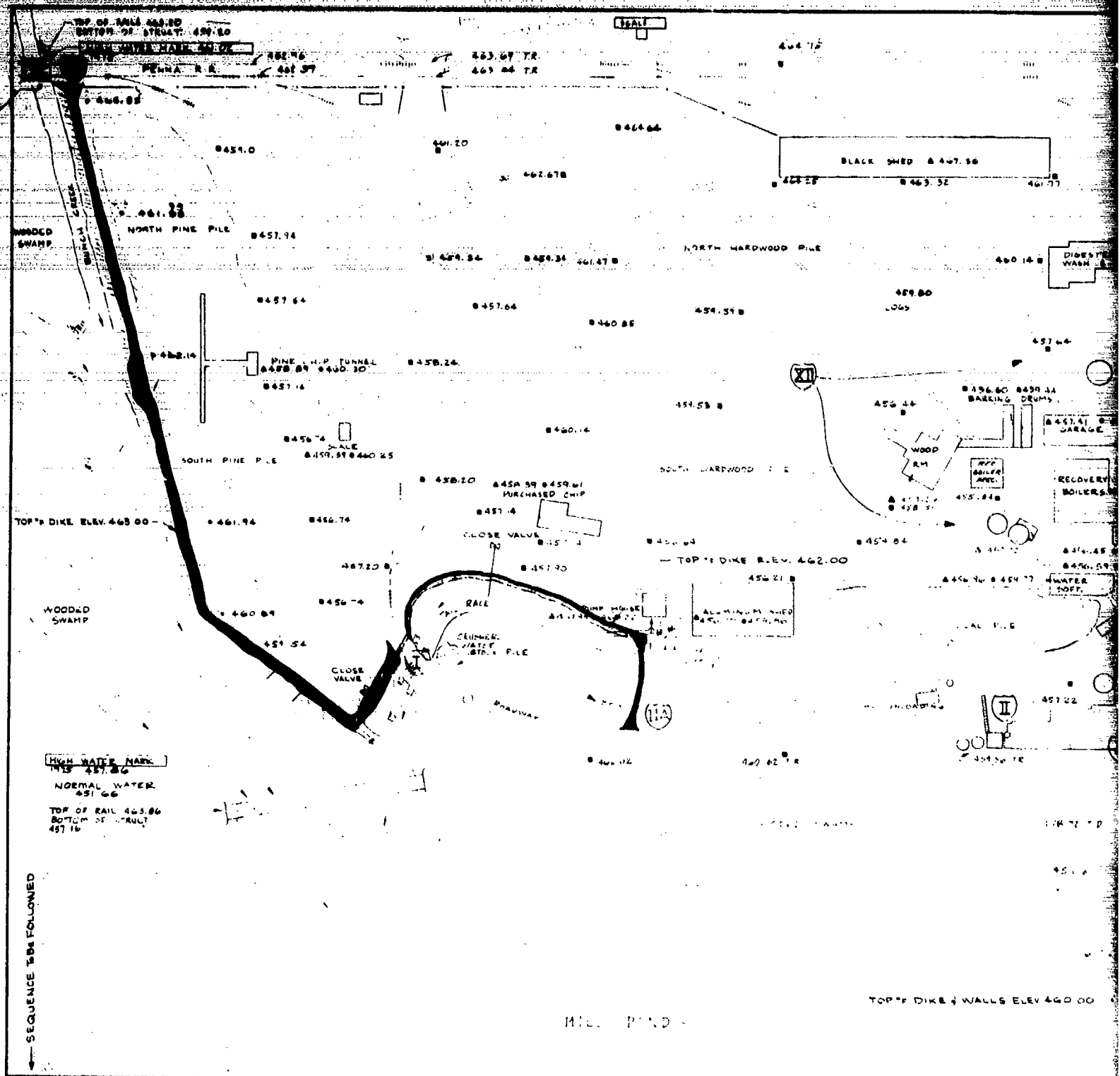
Scale
$\frac{1}{4}$" = 1 Foot

Gross Section of Dam Breast
to be faced with reinforced concrete
for
The P H Glatfelter Co
Spring Grove
York Co., Pa

West Branch
Codorus Creek

PLATE IV
PA-01026

12



AREA	DESCRIPTION	Nº / BAGS	REMARKS
I	CRUSHER WASTE / BULLDOZER	* (1400)	2 ROWS IF SAND BAGS ARE USED
IA	MATERIAL @ S.T.E. - BULLDOZER	(88)	TOP OF DIKE TO TOP OF HIGH TRACK RAIL
II	COAL - DUMP TRUCK, LOADER, BULLDOZER	* (620)	2 1/2 ROWS IF SAND BAGS ARE USED
IIA	COAL / DUMP TRUCK, LOADER, BULLDOZER OR CRUSHER WASTE	* (88)	COAL OR SAND BAGS OVER TRACKS
III	STORE FILLED BAGS @ EARTHEN DIKE WEST OF IRRIGATION	5	ACROSS TRACK
IV	SAND BAGS	21	MANHOLE AREA
V	SAND BAGS	111	10 MANHOLES
VI	SAND BAGS OR MATERIAL ON ROAD / BULLDOZER	* 442	ACROSS BOTH ROADS
VII	SAND BAGS	15	DRAIN @ CLAY UNLOADING AREA
VIII	SAND BAGS	15	DRAIN @ CLAY UNLOADING AREA
IX	SAND BAGS	350	ACROSS ROAD & TRACKS
X	SAND BAGS	140	AROUND Nº 8 MACHINE PULPER PIT (DRY END)
XI	SAND BAGS	230	ACROSS WALKS & TRACKS
XII	SAND BAGS	331	MONITER DRAINS & SAND BAG AS REQUIRED (XII & MISCELLANEOUS)

TOTAL SANDBAGS REQUIRED:
USING SANDBAGS ALL AREAS = 4103
& ELIMINATING SANDBAGS IN AREAS (II

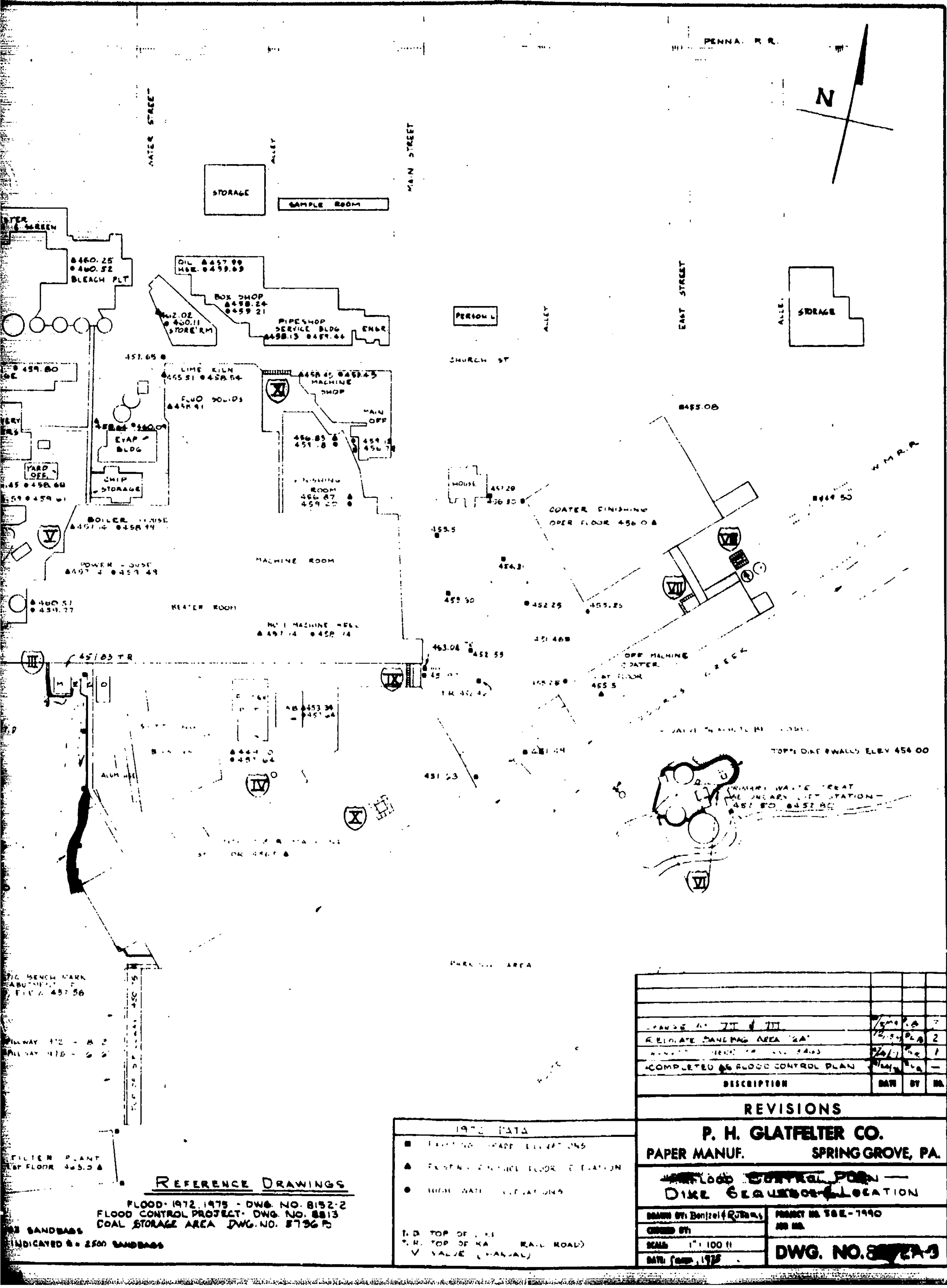


PLATE V

FA-01028

APPENDIX F

GEOLOGIC REPORT

GEOLOGIC REPORT

Bedrock - Dam and Reservoir

The entire dam and reservoir lie within the Cambrian age Kinzers Formation. This formation consists of interbeds of gray shales, limestones and dolomites. Some 1000 feet (0.30 Km) is a lobe of the Ledger Formation which is a gray, massive dolomite. Approximately 600 feet (0.18 Km) to the south of the reservoir is the contact of the gray quartzite of the Antietam Formation. These last two formations should have little effect on the localized geology of the dam and reservoir area.

Structure

There are no apparent major structural features in the immediate area which would influence the geology of the dam and reservoir. However, due to the occurrence of the limestones and dolomites, there is a strong possibility of the existence of subsurface solution features occurring along the joints, fractures and bedding planes of these rocks. This greatly increases the chances of subsurface seepage within the formation. The extent of seepage, if any, is dependent on the specific lithology of the reservoir area.

Overburden

The major soil type surrounding the dam and reservoir is the Chewaela silt loam. This is a moderately well-drained alluvial soil deposited on the floodplain surrounding the reservoir.

Aquifer Characteristics

The Kinzers Formation is a relatively good aquifer with reported yields of 2 to 30 gpm (0.13-1.19 l/s) and a median yield of 17 gpm (1.1 l/s). This should be kept in mind when considering the existence of subsurface seepage.

Discussion

Due to the occurrence of limestone and dolomite within the formation, subsurface exploration should be employed prior to any construction. This should be done in order to determine the existence and extent of any solution activity. Otherwise, the Kinzers Formation should provide a good foundation for heavy structures. According to available construction plans, the dam was carried to a firm foundation. If so, subsurface seepage should be minimal, but not discounted altogether.

Sources of Information

1. McGlade, W.G., et al., 1972. Engineering Characteristics of the Rocks of Pennsylvania, Pennsylvania Geological Survey EG-1.

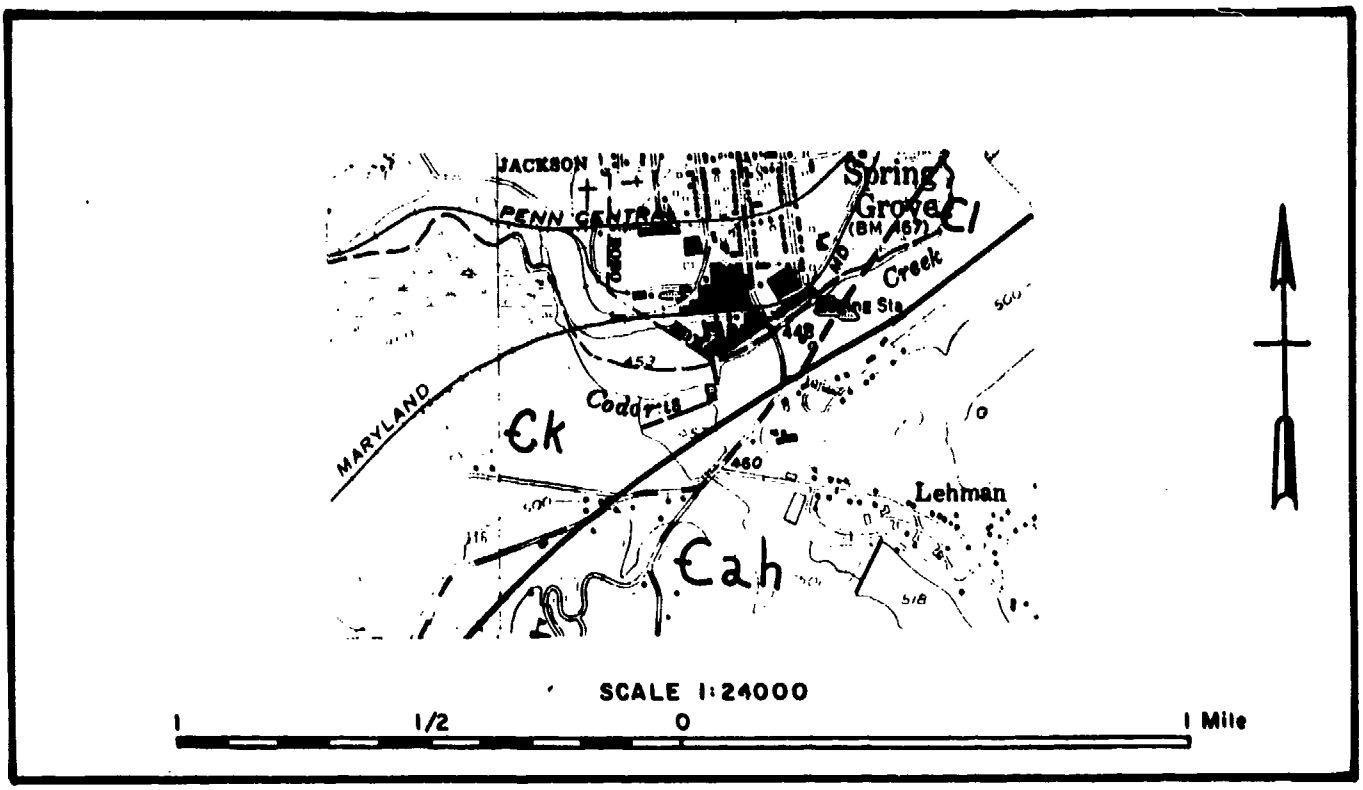
2. Stose, W.G., et al., 1973. Geology and Mineral Resources of York County, Pennsylvania Geological Survey Bulletin C-67.

3. Wilshusen, J.P., 1979. Environmental Geology of the Greater York Area, York County, Pennsylvania. Pennsylvania Geological Survey EG-6.

4. Soil Survey - York County, 1936. Soil Conservation Service U.S.D.A.

5. Pennsylvania Geological Map Worksheet - York Quadrangle, 1980. Pennsylvania Geological Survey.

GEOLOGICAL MAP - SPRING GROVE DAM



LEGEND

Ck	Kinzers Formation
Cah	Antietam Formation
Cl	Ledger Dolomite